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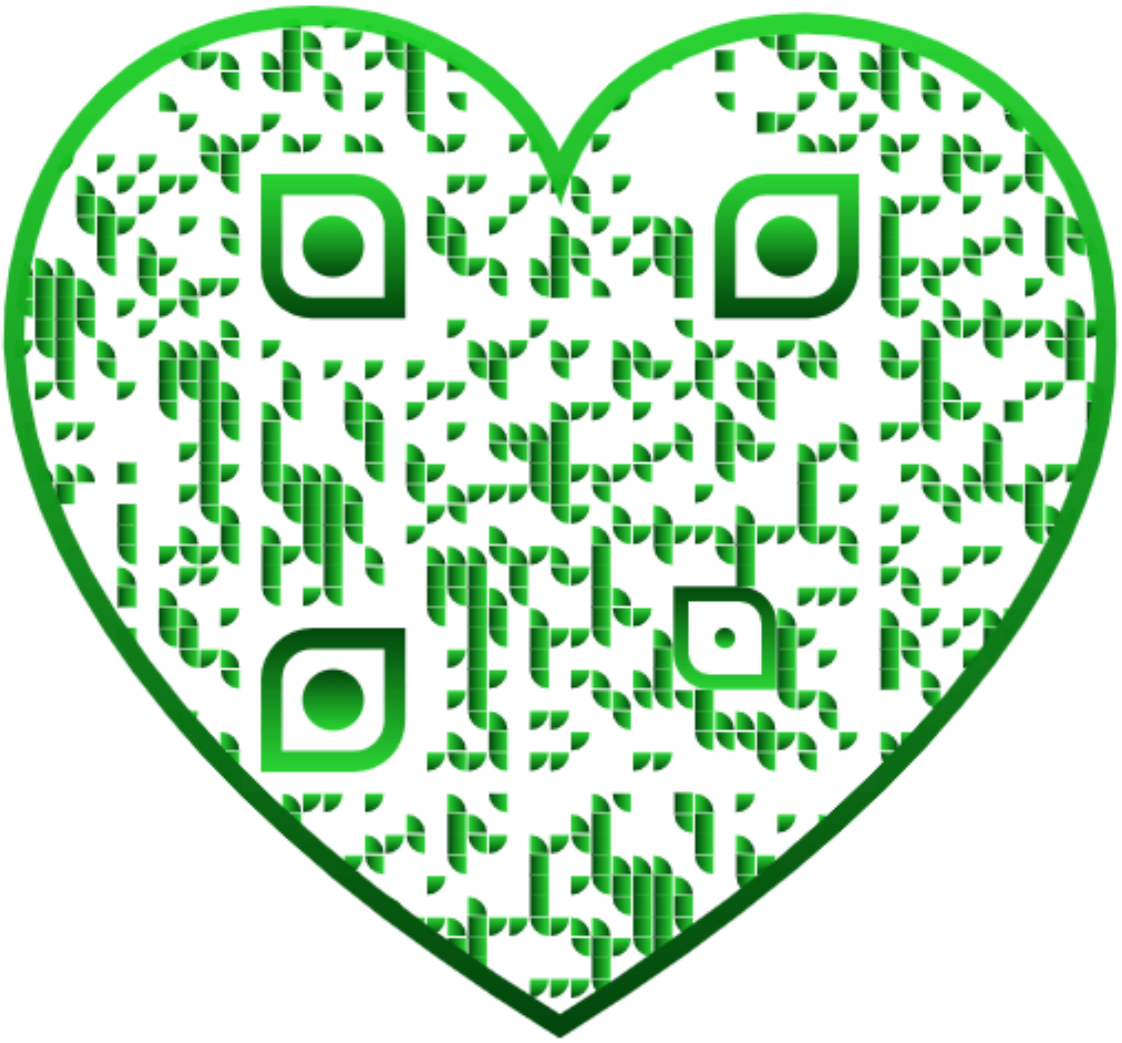

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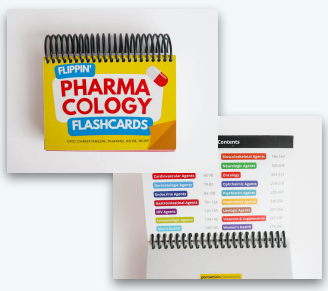

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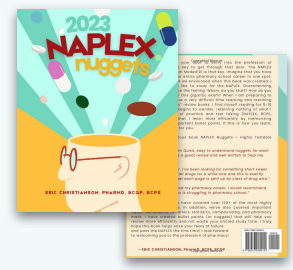

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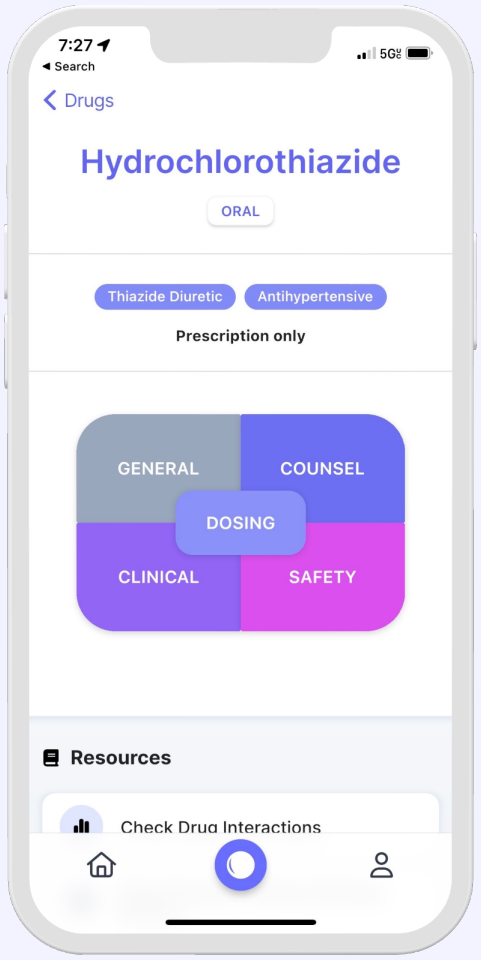

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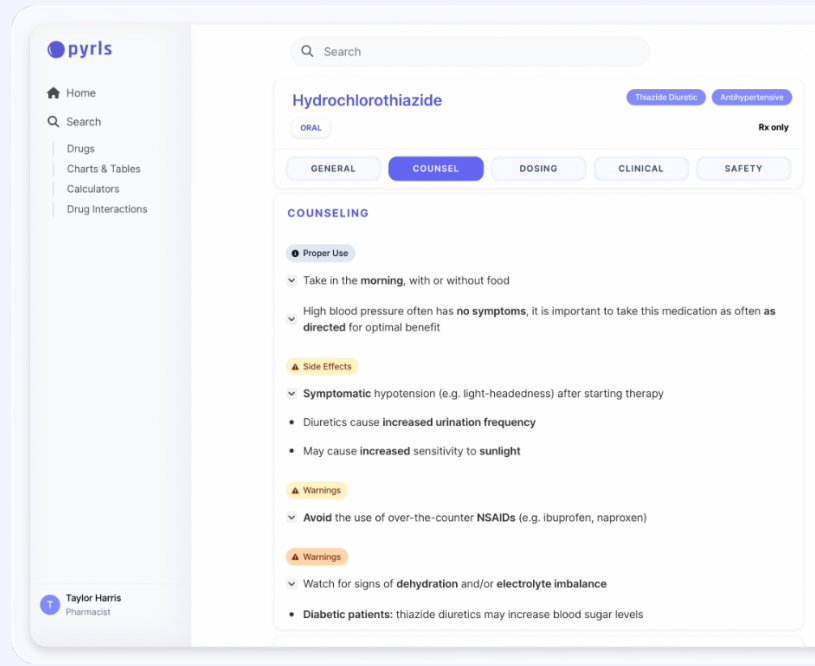

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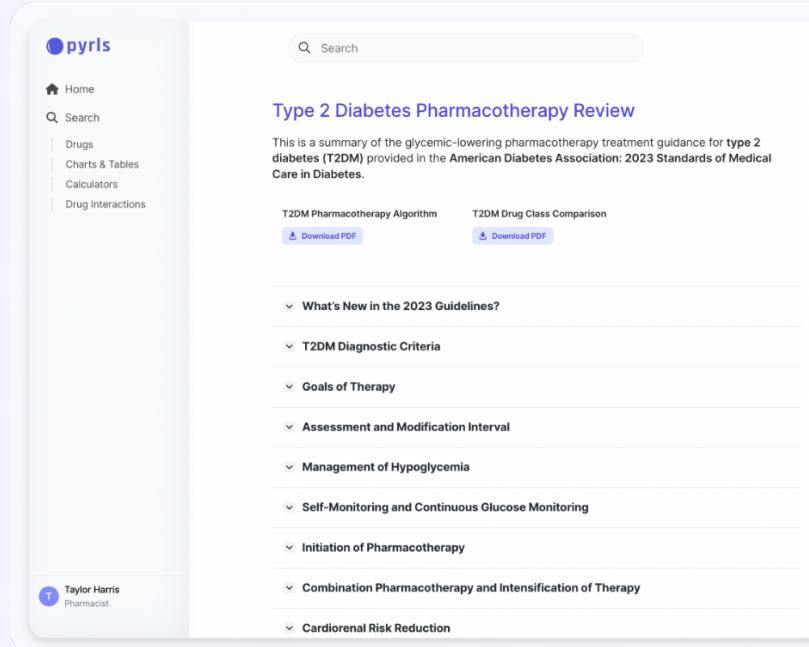

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1. A 34-year-old female presents with symptoms of fatigue, weight gain, increased sensitivity to cold, worsened mood and constipation. Current lab work reveals a hemoglobin of 14.2 g/dL, creatinine of 1.1 mg/dL, B12 of 400 pg/mL, folic acid of 15 ng/mL, and TSH of 26.5 mIU/L. Current medications include: Synthroid 50 mcg daily, Zoloft (sertraline) 75 mg daily, and folic acid 1 mg daily. The patient is taking all medications as directed. What would you recommend?

   A. Increase Zoloft to 100 mg daily
   B. Consider the addition of vitamin B12
   C. Increase Synthroid to 75 mcg daily
   D. None of the above

   Based on the presented symptoms and lab results, the patient is likely experiencing symptoms of hypothyroidism, which is evidenced by the elevated TSH level. Therefore, it would be appropriate to increase the Synthroid (levothyroxine) dosage to improve symptoms. There is no evidence to suggest that increasing the dosage of Zoloft (sertraline) would help with the patient's symptoms, so Option A is not recommended.

   The patient's B12 level is within the normal range, so there is no indication to add vitamin B12 at this time, making Option B not recommended.

   Therefore, the correct answer is C. Increase Synthroid to 75 mcg daily. However, it is important for the patient to follow up with her healthcare provider for further evaluation and monitoring.

2. How many mg of a medication will it take to create a 1,500 mL product at a concentration of 1:10,000?

   Fill in the Blank: **150 mg**

   For weight/volume (w/v) ratios, 1:100 (1%) means 1 gram per 100 mL.
   Therefore, 1:10,000 (0.01%) means 1 gram per 10,000 mL.
   1 g/10,000 mL = 1,000 mg/10,000 mL = 0.1 mg/mL
   Since 1,500 mL of total volume are needed at this concentration, multiply by 1,500 mL to determine how many total milligrams are required.
   0.1 mg/mL x 1500 mL = **150 mg**

3. Which of the following would be most appropriate in a patient with HIV requiring PCP (Pneumocystis carinii pneumonia) prophylaxis?
   A. Doxycycline
   B. Bactrim
   C. Erythromycin
   D. Augmentin

   Bactrim (sulfamethoxazole-trimethoprim) is the drug of choice for PCP prophylaxis.

4. Which of the following medications for diabetes would carry the least risk of hypoglycemia?
   A. Glucophage
   B. Glucotrol
   C. Lantus
   D. Humalog

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Answer - Metformin is the least likely to cause hypoglycemia as it doesn't stimulate insulin release. Glucotrol (glipizide) is a sulfonylurea which directly stimulates beta cells to release insulin. Lantus and Humalog are long acting and short acting insulin (respectively) so they certainly carry a risk of hypoglycemia.

5. A physician writes for a dose of Tylenol 20 grains twice daily. What dose of acetaminophen is this?
   A. 325 mg twice daily
   B. 650 mg twice daily
   C. 1000 mg twice daily
   D. 1300 mg twice daily

   Remember the conversion of grains to milligrams is about 5 grains to 325 mg (1 grain = 64.8 mg) – this should help you answer any question that may use grains.

Answer the following 3 questions based on the case:

A 48-year-old male has a history of bipolar disorder, Crohn's disease, and was diagnosed with atrial fibrillation within the last year. He was prescribed amiodarone for atrial fibrillation. Other medications include Depakote, Lamictal, aspirin, and azathioprine.

Vital signs include: Pulse = 76 bpm, Blood pressure = 135/68 mmHg, Respirations = 18 breaths per minute, weight = 168 lbs. His current laboratory testing reveals Creatinine = 1.1 mg/dL, Potassium = 4.3 mEq/L, sodium = 139 mEq/L, albumin = 4.1 g/dL, AST = 798 U/L, ALT = 924 U/L, hemoglobin = 14.1 g/dL, and CPK = 86 units/L.

6. Which medications could contribute to the lab abnormalities? (select all that apply)
   A. Depakote
   B. Aspirin
   C. Azathioprine
   D. Amiodarone

   The elevated LFTs are probably caused by amiodarone especially if the timing makes sense. We don't know that from this case. Depakote (divalproex) and azathioprine are two other medications that LFTs should be monitored for and could potentially contribute to the elevation. Aspirin is the least likely to contribute to the elevated LFTs.

7. Based upon the medication list, which of the following is a significant interaction?
   A. Depakote/Lamictal
   B. Amiodarone/Aspirin
   C. Azathioprine/Aspirin
   D. Depakote/Azathioprine

   Depakote (divalproex)/Lamictal (lamotrigine) is a major interaction. Depakote decreases Lamictal clearance, and there is a recommended dosing regimen specific to starting Lamictal in a patient already on Depakote.

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8. Our patient from above has also had an issue with multiple infections. Which medication puts him at the highest risk for recurrent infections?
   A. Lamictal
   B. Amiodarone
   C. Depakote
   D. Azathioprine

   Azathioprine is an immunosuppressive medication and would be most likely to put this patient at risk for infections

9. In a patient with a creatinine clearance of less than 30 mL/min and ongoing edema that is not helped by increasing the furosemide dose, which of the following would be the best option to help with edema?
   A. Adding hydrochlorothiazide
   B. Adding Bumex
   C. Adding metolazone
   D. Adding captopril

   Hydrochlorothiazide will likely not be effective given the poor kidney function. Bumex is a loop diuretic and would be duplicate therapy as is already on furosemide. Captopril is an ACE inhibitor and wouldn't be of benefit for the edema. Metolazone (Zaroxolyn) is the thiazide diuretic of choice to help with edema when Lasix resistance is present.

10. Which of the following hypertension medications can also be beneficial for BPH symptoms?
    A. Norvasc
    B. Hytrin
    C. Zestril
    D. Lasix

    Alpha blockers like Hytrin (terazosin) can be beneficial for both hypertension and BPH.

11. Which of the following is not a common physiological complication in the aging of an elderly patient? (Select all that apply)
    A. Skin thickening, increasing the risk of skin and soft tissue infections
    B. Slowed GI tract and possible reduced absorption of some vitamins and minerals like B12 and iron
    C. A drop in GFR which can contribute to the accumulation of many medications
    D. Increased concentration of albumin due to loss of intravascular fluid/dehydration
    E. Loss of muscle mass, reduced physical conditioning

    Answer – Skin thinning is more likely with aging, leading to possible risk of infections, abrasions, etc. Lower blood albumin is more likely with malnourishment. This can increase the free fraction of many drugs (warfarin, albumin).

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Answer the following three questions based on the information:

You have a patient who has been given a 500 mL bag that contains 60 mEq of potassium chloride. The IV is delivering 20 drops per mL at a rate of 8 drops per minute. It has been running for about 3 hours.

The molecular weight of K+ = 39 g/mol and Cl- = 35.5 g/mol.

12. How many mEq of potassium has this patient been given?

    Fill in the blank to the nearest 1/100th decimal place: **8.64** mEq

    60 mEq/500 mL = 0.12 mEq/mL
    8 drops/min x 180 min =1440 drops
    1440 drops / 20 drops per min = 72 mL
    72 mL x 0.12 mEq/mL = **8.64 mEq**

13. How many mg of potassium chloride has this patient been given?

    Fill in the blank to the nearest whole number: **644 mg**

    The molecular weight of potassium chloride is approximately 74.5 g/mol (39 g plus 35.5 g). To convert the molecular weight of potassium chloride (KCl) into milliequivalents (mEq), you need to know the valence of each ion in the compound.

    Potassium has a valence of +1, meaning that it can donate one positive charge (or one electron). Chloride has a valence of -1, meaning that it can accept one negative charge (or one electron).

    1 mEq (weighed in mg) = atomic weight (or molecular weight)/valence
    The molecular weight of KCl is approximately 74.5 g/mol. Using the equation above, 1 mEq of KCl weighs approximately 74.5 mg.

    Using this information plus the answer from the previous question, we can determine how many mg of KCl the patient has been given.

    8.64 mEq x 74.5 mg per mEq = 643.68 mg (rounded up to **644 mg**).

14. Which of the following medications would be likely to contribute to hyperkalemia, especially in patients already receiving an ACE inhibitor or an ARB? (select all that apply)
    A. Spironolactone
    B. Trimethoprim
    C. Lasix
    D. Zaroxolyn

    Trimethoprim can reduce the elimination of potassium. When used with an ACE inhibitor or ARB (which are known to cause increased potassium levels) this effect can contribute to hyperkalemia. Spironolactone is a potassium-sparing diuretic associated with an increased risk for hyperkalemia. Lasix and Zaroxolyn are a loop and thiazide-like diuretic, respectively. They are more likely to cause hypokalemia.

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15. Rate these in order from highest strength of evidence to lowest?
    A. Case study
    B. Randomized controlled clinical trial
    C. Cohort study
    D. Case controlled series

    Order should be from highest strength to lowest: **B, C, D, A**

    Remember the strength of evidence in regards to drug study designs. Double-blind, randomized controlled clinical trials have the highest strength whereas a single case study would certainly have the least.

16. An 85-year-old female is on metoprolol for atrial fibrillation, Bactrim for UTI prophylaxis, and felodipine for hypertension. This patient had a recent cerebrovascular accident (CVA) and the primary provider would like to start Coumadin on this patient. Which of the following would be the most appropriate starting dose?
    A. 2.5 mg daily
    B. 5 mg daily
    C. 2.5 mg twice daily
    D. 10 mg daily

    General initial dosing of Coumadin (warfarin) is 2-5 mg daily. In the elderly, it is extremely important to start Coumadin dosing low, and it is doubly important in this case as Bactrim can interact (via CYP2C9 inhibition) and cause elevations in Coumadin concentrations in the body. You could make the argument for an even lower starting dose, but given the options, 2.5 mg daily is the best choice.

17. Which of the following medications is least likely to cause renal failure?
    A. Augmentin
    B. Gentamicin
    C. Losartan
    D. Celebrex

    Augmentin (amoxicillin-clavulanate)is least likely to cause renal failure. Aminoglycosides, ARBs, ACEis, and NSAIDs are all examples of medications that can contribute to renal failure.

18. What is the most common cause of erythropoietin failure?
    A. B12 deficiency
    B. Iron deficiency
    C. Poor absorption in cachectic patients
    D. Liver disease

    The most common cause of erythropoietin failure in kidney disease is iron deficiency. Iron is an essential nutrient for red blood cell production, and when the kidneys are not functioning properly, they may not be able to regulate iron levels in the body. As a result, iron deficiency anemia can occur, which can lead to erythropoietin resistance and failure.

    While vitamin B12 deficiency and poor absorption can also contribute to anemia, they are

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less common causes of erythropoietin failure in kidney disease. Liver disease is also not a common cause of erythropoietin failure in kidney disease.
Iron stores should be assessed closely, especially in patients that are not seeing an increase in hemoglobin.

19. A 55-year-old male with a history of alcoholism is diagnosed with liver failure. Current laboratory testing reveals elevated ammonia levels. What is the most appropriate therapy to treat the elevated ammonia level?
    A. Propranolol
    B. Metoclopramide
    C. Lactulose
    D. Thiamine

    Propranolol is often used for treating portal hypertension in the management of esophageal varices, but it will not lower ammonia levels. Thiamine is often supplemented in alcoholics, but it won't lower ammonia levels. Reglan (metoclopramide) is often used for treating GI conditions. Of the available choices, lactulose is the only appropriate treatment for elevated ammonia.

20. What is the active metabolite of codeine?
    A. Fentanyl
    B. Oxycodone
    C. Morphine
    D. Methadone

    Codeine is converted via CYP2D6 to morphine, which provides the analgesic effects.

21. What is the primary mechanism of action of Requip?
    A. Inhibits NMDA receptors
    B. Inhibition of GABA receptors
    C. Dopamine agonist
    D. Activate Mu receptors

    Requip (ropinirole) is a dopamine agonist typically used for restless legs syndrome and occasionally Parkinson's disorder.

22. Which of the following side effects would be least likely with Aricept?
    A. Nausea
    B. Constipation
    C. Weight loss
    D. Cognitive changes

    Aricept (donepezil) is an acetylcholinesterase inhibitor for dementia – it is going to produce the OPPOSITE effects of anticholinergic medications. It would more likely cause diarrhea, not constipation, as a side effect.

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23. A 62-year-old Caucasian male presents to the hospital with NSTEMI. He became short of breath prior to being admitted to the hospital. Biomarkers for troponin and creatine kinase (CK) were noted to be elevated upon lab assessment. His labs are as follows:
    - Creatinine clearance: 71 mL/min
    - Sodium: 138 mEq/L
    - Potassium: 3.4 mEq/L
    - LFTs: within normal range
    - BP: 152/92 mmHg
    - Pulse: 79 bpm
    - TIMI Risk score: 4
    - Hemoglobin: 14.1 g/dL
    - Platelets: 297,000 per uL

Which of the following agents would be recommended upon discharge for this patient? (select all that apply)

A. **Atorvastatin**
B. **Aspirin**
C. **Metoprolol**
D. **Lisinopril**
E. Isosorbide mononitrate

Answer – A, B, C and D.

Statins, beta-blockers, antiplatelet agents (low-dose aspirin), and ACE inhibitors would all be appropriate to initiate. Long-acting nitrates are not going to be part of a routine regimen post-MI.

Answer the following 2 questions based on the information presented.

A patient whose weight is 145 lbs and whose height is 5’3” is to receive a dose of Drug X. The dosing for Drug X is 1200 mg/m^2

24. What dose would be required for this patient? Round to the nearest 100.

Fill in the blank: **2100 mg**

The most commonly used equation to calculate body surface area (BSA) is the Mosteller formula, which is:

BSA (in m^2) = square root of [(height in cm x weight in kg) / 3600]

Where height is measured in centimeters (cm) and weight is measured in kilograms (kg).

145 lbs / 2.205 lbs per kg = 65.77 kg
5 ft 3 inches = 63 inches, x 2.54 cm per inch = 160.02 cm

BSA (m2) = square root of [(160.02 cm x 65.77 kg) / 3600] = 1.71 m2

1.71 m2 x 1200 mg per m2 = 2052 mg (rounds up to **2100**).

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25. What is this patient's BMI?
Fill in the blank: **25.7**

The equation for calculating body mass index (BMI) is:
BMI = weight in kilograms / (height in meters)^2

Where weight is measured in kilograms and height is measured in meters.
BMI = 65.77 kg / (1.6 m)^2 = **25.7**

Alternatively, weight can be measured in pounds and height can be measured in inches, but the formula needs to be adjusted slightly to account for the difference in units:
BMI = (weight in pounds / (height in inches)^2) x 703

Where 703 is a conversion factor that adjusts for the use of the imperial system (pounds and inches) instead of the metric system (kilograms and meters).

BMI = (145 lbs / (63 in)^2) x 703 = **25.7**

26. A 78-year-old female presented to the emergency department with increased coughing, shortness of breath, and a mild elevation in temperature. The patient has type 2 diabetes. She is diagnosed with community-acquired pneumonia and the decision for outpatient antibiotic therapy is made. What is the most appropriate empiric therapy?
A. Azithromycin
B. Ciprofloxacin
C. Doxycycline
D. Amoxicillin-clavulanate plus doxycycline

According to the 2019 IDSA/ATS Treatment Guidelines for Community-Acquired Pneumonia, the choice of empiric therapy should be based on the severity of the patient's illness, risk factors for drug-resistant pathogens, and local patterns of antimicrobial resistance.
The patient has a comorbid condition of type 2 diabetes, therefore monotherapy with azithromycin or doxycycline would not be preferred. Additionally, given that the local resistance patterns to macrolide therapy are not known, macrolide therapy would not be ideal.

Ciprofloxacin does not provide necessary coverage against S. pneumoniae, which is the predominant pathogen for community acquired pneumonia.

The only appropriate therapy listed is Option D (amoxicillin-clavulanate plus doxycycline).

27. A 55-year-old male with a past medical history of GERD, hypertension, and alcoholism is diagnosed with a *C. difficile* infection. This is the first known episode. Which is the most appropriate therapy?
A. Metronidazole
B. Oral vancomycin
C. Clindamycin
D. Doxycycline

Per the 2017 IDSA/SHEA Clinical Practice Guidelines for Clostridium difficile Infection, oral vancomycin or fidaxomicin are preferred over metronidazole to ensure resolution of

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symptoms and sustained relief one month after treatment. Because fidaxomicin is not listed, oral vancomycin is the most appropriate therapy.

If the preferred agents are not available, metronidazole may be used for non-severe cases. Some clinicians may choose to avoid use of metronidazole in patients abusing alcohol due to concerns for a disulfiram-like reaction. However, recent data suggests this is not necessary.

It is commonly thought that consumption of alcohol while taking metronidazole or tinidazole could result in a highly unpleasant disulfiram-like reaction; however, this warning, which is included in the FDA prescribing information, was based on older laboratory experiments and individual case histories where the reactions were equally likely to be due to alcohol alone. Current recommendations from the CDC suggest that avoiding alcohol is unnecessary, as review of available data suggests there is no convincing evidence of a disulfiram-like reaction between metronidazole or tinidazole and alcohol. Further, neither metronidazole or tinidazole inhibit acetaldehyde dehydrogenase (unlike disulfiram), making them incompatible with producing the disulfiram-like reaction.

28. A 74-year-old female is currently taking the following medications: famotidine, diltiazem, amiodarone, and Tylenol. She has been experiencing edema of late. Which medication would be most likely to cause or worsen this symptom?
    A. Famotidine
    B. Diltiazem
    C. Amiodarone
    D. Tylenol

    Calcium channel blockers (CCBs) are a notorious cause of edema. Also, it is important to note that diltiazem (non-dihydropyridine CCBs can be used in atrial fibrillation – i.e. they can slow heart rate). Dihydropyridine CCBs, like amlodipine, do not have action on heart rate.

29. A 32-year-old female presents to your pharmacy with a bottle of St. John's wort. She is currently on birth control containing estrogen. What is the concern with taking these together?
    A. St. John's wort is an enzyme inhibitor and can reduce estrogen concentrations in the body
    B. St. John's wort is an enzyme inducer and can reduce estrogen concentrations in the body
    C. St. John's wort is an enzyme inhibitor and can increase estrogen concentrations in the body leading to increased risk of adverse effects
    D. St. John's wort is an enzyme inducer and can increase estrogen concentrations in the body leading to increased risk of adverse effects

    St. John's wort is a natural remedy available over-the-counter used to improve mood and lower anxiety. However, it is known to interact with many medications, including birth control pills that contain estrogen.

    St. John's wort induces the activity of enzymes in the liver that metabolize estrogen and other hormones. This can lead to decreased effectiveness of birth control pills, as the rapid metabolism of estrogen can lead to lower blood levels of the hormone, potentially reducing the effectiveness of the contraceptive.

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30. Which of the following medication patches would it be appropriate to cut and still use?
    A. Fentanyl
    B. Exelon
    C. Lidoderm
    D. Scopolamine

    Lidoderm (lidocaine patch) is the only one that would be appropriate to cut. Lidoderm patches may be cut into smaller sizes with scissors prior to removal of the release liner. Cutting into the other patches (which are extended-release formulations) may lead to higher rates of drug release, increasing the risk for serious side effects (and overdose, in the case of fentanyl).

31. Which antidepressant would be most beneficial in a patient who is trying to avoid the side effect of sexual dysfunction?
    A. Zoloft
    B. Lexapro
    C. Wellbutrin
    D. Pamelor

    Clinical studies have shown that bupropion has a lower risk of causing sexual dysfunction compared to other antidepressants. In fact, some studies have shown that bupropion may even improve sexual function in some patients.

32. Which of the following medications can increase the risk for osteoporosis?
    A. Zofran
    B. Prednisone
    C. Tramadol
    D. Methotrexate

    Long-term use of corticosteroids is known to increase the risk for developing osteoporosis.

33. The prescription for eye drops calls for 2 drops in the left eye twice daily. Given the following choices of package size, how many milliliters should be dispensed to get at least a month's supply while minimizing excess?
    A. 2.5 mL
    B. 5 mL
    C. 7.5 mL
    D. 10 mL

    In this case you need 4 drops per day. 4 drops per day multiplied by 30 days gives you a total of 120 drops. Most eye drops are about 0.05 mL which equals 20 drops per mL. 6 milliliters would give you about 120 drops. 5 mLs would be too short, so 7.5 mLs would be the best answer.

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34. A 33-year-old male with a history of asthma was recently started on an albuterol inhaler. Which of the following would be an important education point?

A. Rinse mouth with water and and spit following administration to prevent thrush
B. This medication may interact with over the counter antitussives, like Robitussin
C. This medication may cause an short-term increase in heart rate
D. This medication should not be used in patients with a history GERD

Rinsing the mouth with water and spitting following each dose is intended to prevent thrush from inhaled corticosteroids (e.g., budesonide, fluticasone, etc.), not inhaled albuterol. A history of GERD and/or use of OTC cough medications is not expected to interact with this patient's albuterol.

35. Which of the following medications would be most useful in the treatment of hyperphosphatemia in chronic kidney disease?

A. Carafate
B. Sevelamer
C. Calcitriol
D. Miacalcin

Sevelamer is a phosphate binder used to help treat high phosphorus levels in the body (usually caused by chronic kidney disease). Calcitriol is a vitamin D analog usually used for hyperparathyroidism or hypocalcemia issues. Carafate is used to help alleviate GI symptoms. Miacalcin is used in the treatment of osteoporosis.

36. Which of the following would be appropriate monitoring for adverse effects of hydroxychloroquine?

A. Routine foot exams
B. Routine eye exams
C. CPK (especially with statin therapy)
D. Neuropathy

Hydroxychloroquine is an antimalarial drug that is also used to treat autoimmune conditions such as rheumatoid arthritis and lupus. One of the potential adverse effects of hydroxychloroquine is retinopathy, a condition that affects the retina of the eye and can lead to vision loss.

Therefore, it is recommended to have regular eye exams before and during treatment with hydroxychloroquine to monitor for any signs of retinopathy.
Routine foot exams, CPK monitoring, and neuropathy monitoring are not typically indicated for adverse effects of hydroxychloroquine.

37. Which of the following would be least appropriate for the management of acute pain?

A. Ibuprofen
B. Duragesic
C. Oxycodone
D. Tramadol

Duragesic (fentanyl transdermal) is only indicated for management of pain in opioid-tolerant patients that require daily, around-the-clock, long-term opioid treatment

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for which alternative treatment options are inadequate. Additionally, it has a very slow onset that would take hours to a day or two for a patient to start feeling the analgesic effects. For these reasons, it would not be appropriate for treating a patient who is in acute pain.

38. A 78-year-old male has a history of diabetic neuropathy and BPH. He presents with symptoms of worsening neuropathy. He has been treating it with over the counter Tylenol. Which medication would be LEAST appropriate to initiate?
    A. Duloxetine
    B. Amitriptyline
    C. Pregabalin
    D. Neurontin

    While TCAs like amitriptyline might be useful for neuropathy in certain patients, they are highly anticholinergic and could lead to urinary retention which is not ideal in a patient with BPH. Amitriptyline is one of the most highly anticholinergic TCAs.

39. Which of the following medications is most likely to cause a GI bleed?
    A. Celebrex
    B. Ketorolac
    C. Acetaminophen
    D. Ultram

    Celebrex (COX-2 inhibitor) tends to be a little less irritating on the GI tract than traditional NSAIDs. Ketorolac is one of the worst NSAIDs in terms of GI irritation/bleeds. Tylenol is one of the safest analgesics in the elderly. Tramadol will likely not cause a GI bleed as well.

40. Capsaicin is a topical product used in the treatment of muscle pain. What is its primary mechanism of action?
    A. Acts as a counter irritant at site of application
    B. Depletes substance P
    C. Increases protein C at the site of action
    D. Inhibition of prostaglandin synthesis

    Capsaicin is a natural compound found in hot peppers, and it is believed to work by depleting substance P, a neurotransmitter that transmits pain signals to the brain. Depletion of substance P takes a significant amount of time. This medication will likely not be effective for acute pain relief or when used on an as-needed basis.

41. A 77-year-old male with a history of multiple DVTs is currently receiving warfarin therapy. He is diagnosed with osteomyelitis and treatment with rifampin is initiated. What will likely happen to INR when rifampin is discontinued?
    A. INR will go up
    B. INR will go down
    C. INR will be unaffected
    D. Too little information to tell

    Rifampin is a classic enzyme inducer. When it is initiated, it will likely cause Coumadin/INRs to go down. When it is discontinued, it will stop inducing metabolism and INRs will likely increase.

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42. A 57-year-old male has been initiated on Aldactone. What should be monitored?
    A. Liver function
    B. Potassium levels
    C. Albumin
    D. Pulses

    Aldactone (spironolactone) is a potassium-sparing diuretic and can cause hyperkalemia. Check potassium levels within 1 week of initiation or titration and regularly thereafter. More frequent monitoring may be needed when given with other drugs that cause hyperkalemia or in patients with impaired renal function.

43. What is the primary objective of HIPAA?
    A. Facilitate communication amongst healthcare professionals
    B. Protect the patient's right to keep their healthcare information private
    C. Minimize risk of frivolous lawsuits against medical professionals
    D. Improve cost containment measures with pharmaceutical manufacturers

    HIPAA was designed to prevent private healthcare information from being shared in a public forum or for unauthorized purposes.

44. A patient that is a poor CYP3A4 metabolizer would have what effect on the use of Plavix?
    A. Increased risk of bleed
    B. Increased risk of clot
    C. No change
    D. Increased risk at low doses and lower risk at higher doses

    Plavix (clopidogrel) is a prodrug metabolized by CYP2C19. In this case, it wouldn't matter if the patient was a poor CYP3A4. If the patient was a poor CYP2C19 metabolizer, it would likely lead to reduced medication efficacy.

45. What class of medication would likely be used for esophageal varices associated with liver cirrhosis?
    A. ACE inhibitor
    B. Alpha blocker
    C. Calcium channel blocker
    D. Beta-blocker

    Specifically, non-selective beta blockers like nadolol and propranolol would be used for esophageal varices prophylaxis.

46. Which of the following medications warrants monitoring for pulmonary fibrosis?
    A. Amiodarone
    B. Hydralazine
    C. Nabumetone
    D. Imodium

    Amiodarone can cause pulmonary fibrosis (sometimes called blue man syndrome).

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47. A 66-year-old female was recently started on Lamictal. What is an important educational point that this patient should look out for?
    A. The medication can cause discoloration of the urine
    B. Immediately report any sign of rash to provider
    C. The medication should not be taken with Tylenol
    D. The medication can cause muscle soreness

    Lamotrigine can cause severe skin rashes that require hospitalization and discontinuation of treatment. Almost all cases of life-threatening rashes caused by lamotrigine occurred within 2 to 8 weeks after starting treatment; however, isolated cases appeared after long-term treatment.
    Because it is not possible to predict which rashes will prove to be serious or life threatening, advise patients to contact their provider immediately if any sign of rash occurs.

48. What is the antidote to heparin?
    A. Methylene blue
    B. Phytonadione
    C. Protein C
    D. Protamine sulfate

    Protamine sulfate works by binding to and neutralizing the effects of heparin, which helps to reverse the anticoagulant effects of heparin.

49. Which of the following medications works by antagonizing muscarinic receptors in the bladder?
    A. Ditropan
    B. Phenazopyridine
    C. Myrbetriq
    D. Flomax

    Ditropan (oxybutynin) is an anticholinergic or antimuscarinic medication used in the treatment of overactive bladder. Flomax (tamsulosin) is an alpha blocker, Myrbetriq (mirabegron) is a beta agonist, and phenazopyridine is a urinary analgesic.

Answer the following 2 questions based on the information below.

A 78-year-old white male with a history of atrial fibrillation, hypertension, GERD, and CHF is currently receiving metoprolol 25 mg twice daily, digoxin 0.25 mg daily, omeprazole 20 mg daily, Pepcid 40 mg at bedtime, and aspirin 81 mg daily. Recent labs reveal an elevation in creatinine of 1.8 mg/dL. 6 months ago, creatinine was 1.1 mg/dL. Other information: height = 6 feet 2 inches, weight 178 lbs., blood pressure = 128/78 mmHg, Pulse = 62 bpm, Respiration rate = 21 breaths per minute.

50. Which medication is this change in creatinine most likely to require dose adjustments?
    A. Metoprolol
    B. Pepcid
    C. Omeprazole
    D. Aspirin

    Pepcid (famotidine) has renal dose adjustments for patients with eCrCl ≤ 60 mL/min (in this example, the eCrCl is ~39 mL/min). The other medications listed are not renally dosed. Aspirin could be a concern, if used at analgesic doses, but this is not likely at a dose of 81 mg daily.

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51. Which of the following is NOT consistent with signs of digoxin toxicity?

A. Nausea
B. Vertical nystagmus
C. Bradycardia
D. Weight loss

Vertical nystagmus is a unique sign of Dilantin (phenytoin) toxicity, not digoxin. Weight loss, confusion, bradycardia, and GI effects are all consistent with signs of digoxin toxicity. Also, remember that digoxin is cleared by the kidney – this is a case where we would want to closely monitor digoxin levels given the change in kidney function.

52. Rounding to the nearest whole number, what is the estimated creatinine clearance in this patient?

Fill In the Blank: **39 mL/min**

Est. Creatinine Clearance = [[140 - age(yr)]*weight(kg)]/[72*serum Cr(mg/dL)] (multiply by 0.85 for women). Remember to convert the weight to Kg – so 80.7Kg, Cr = 1.8! **The answer should be 39 mL/min.**

53. A 66-year-old diabetes patient has been recently diagnosed with congestive heart failure. Which diabetes medication would be least appropriate given this new diagnosis?

A. Lantus
B. Pioglitazone
C. Glucotrol
D. Victoza

The TZDs like pioglitazone (Actos) should be avoided if possible in patients with congestive heart failure.

54. A 24 kg 7-year-old male is experiencing a significant fever of 103 degrees Fahrenheit. What dose of Tylenol would you recommend initiating?

A. 100 mg
B. 300 mg
C. 500 mg
D. 700 mg

I would recommend committing the pediatric doses of Tylenol and Ibuprofen to memory if you haven't. Tylenol is 10-15 mg/kg/dose and Ibuprofen is 4-10 mg/kg/dose. For high fevers, you will likely see the higher end of the dosing regimen.

In the above case, it would be 24 kg x 10 – 15 mg/kg giving you a range of 240 to 360 mg. 300 mg would fall in that range.

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55. A new medication for Parkinson's disease is being investigated. Researchers are trying to identify the half-life of the drug. The elimination rate constant is 0.32 per hour. What is the approximate half-life?

A. Too little information to identify
B. 6 hours
C. 4 hours
D. 2 hours

Half-life = 0.693/k (where k is the elimination rate constant)
Half-life = 0.693 / 0.32 per hour = 2.17 hours = ~2 hours

56. Approximately how many grams of NaCl would need to be added to 330 mL of pure water to create an isotonic solution?

A. 3 grams
B. 4 grams
C. 5 grams
D. 6 grams

Isotonic solution of NaCl has 0.9 grams per 100mL (also called normal saline or NS 0.9%). To calculate the amount of NaCl needed to achieve the same concentration in 330 mL of solution, cross-multiplication can be used.
0.9 g/100 mL = X g/ 330 mL
Solving for X provides an answer of 2.97 grams (~ 3 grams) of NaCl.

57. A 77-year-old female is currently on both Coumadin and aspirin with a history of MI and atrial fibrillation. Her neighbor is on a bunch of herbal supplements which she states really helps her feel better. Which of the following supplements would be the highest risk for her to try?

A. Glucosamine
B. Garlic
C. Thiamine
D. Vitamin C

Being on both Coumadin (warfarin) and aspirin this patient is at a high risk of bleeding. Garlic, ginseng, and gingko (3G's) are supplements that can increase the risk of bleeding. It would be most advisable to avoid garlic use in this case.

58. A 19-year-old female presents about 6 hours after ingesting a large, unknown amount of acetaminophen. She is extremely nauseated. What is the most appropriate initial course of action?

A. Administer activated charcoal
B. Give syrup of ipecac to induce vomiting
C. Check an acetaminophen level
D. Administer N-acetylcysteine

Coal tar can bind up drugs in overdose situations but needs to be done very quickly (usually within about an hour of ingestion). Ipecac use is not recommended. Checking an acetaminophen level is useful to monitor, but given that there is a known ingestion and symptoms of toxicity administering the antidote (N-acetylcysteine) would be the best initial course of action. Prompt administration of N-acetylcysteine is important for maximizing

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treatment benefit and preventing serious liver damage.

59. Which of the following is not true regarding the use of long acting nitrates?
    A. They can be given with or without food
    B. They are not used for acute relief of angina
    C. Monitoring blood pressure is warranted while on therapy
    D. Can be used safely with with PDE-5 inhibitors

    Concomitant use with PDE-5 inhibitors (such as Viagra and Cialis) can lead to severe hypotension and an increased fall risk.

Answer the following two questions based on the case:

A 45-year-old female with a history of epilepsy, hypertension, and diabetes is taking the following medications. Dilantin 200 mg twice daily, lisinopril 10 mg daily, metformin 500 mg twice daily, and glipizide 5 mg daily. She was prescribed fluconazole 100 mg twice daily for 14 days about 5 days ago. She has been feeling weak, nauseated, slurring speech, and having difficulty with her gait. Current labs reveal: CrCl = 78 mL/min, sodium 138 mEq/L, potassium 4.4 mEq/L, hemoglobin = 14.6 g/dL, A1C = 7.7%, blood glucose = 99 mg/dL, and Dilantin level = 28 mcg/mL.

60. What is the likely cause?
    A. Side effects from fluconazole
    B. Hypoglycemia
    C. Drug interaction
    D. Anemia

    Diflucan (fluconazole) is a moderate CYP2C9 and CYP3A4 inhibitor and a common cause of drug interactions. It can actually cause elevated drug levels of both glipizide and Dilantin (phenytoin). Hypoglycemia could be a possibility, but with a blood sugar of 99 mg/dL, that is unlikely. The total Dilantin level is elevated (normal range 10-20 mcg/mL) and the patient is displaying symptoms of toxicity.

61. In the patient above, chronic Dilantin use can contribute to which deficiency?
    A. Folate
    B. B12
    C. Vitamin C
    D. Vitamin D

    Phenytoin induces hepatic metabolizing enzymes. This may enhance the metabolism of vitamin D and decrease vitamin D levels. For these reasons, the chronic use of phenytoin has been associated with decreased bone mineral density (osteopenia, osteoporosis, and osteomalacia) and bone fractures.

62. A 66-year-old male with a history of congestive heart failure, diabetes, rheumatoid arthritis, and seizures is started on Mobic. Which disease state is this most likely to worsen?
    A. Congestive heart failure
    B. Diabetes
    C. Rheumatoid arthritis
    D. Seizures

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Congestive heart failure is a condition in which the heart is not able to pump blood effectively, leading to fluid accumulation in the lungs and other parts of the body. Mobic (meloxicam) is a nonsteroidal anti-inflammatory drug (NSAID) that causes a net vasoconstrictive effect and can lead to fluid retention. Therefore, the use of Mobic in this patient with congestive heart failure can worsen his symptoms and lead to clinical complications.

63. Approximately how many kcals are in 30 grams of lipids?
    A. 12 kcals
    B. 27 kcals
    C. 120 kcals
    D. 270 kcals

    Lipids have 9 kcals/gram, dextrose is about 3.4 kcal/gram and protein is about 4 kcal/gram.

    30 grams x 9 kcals/gram = **270 kcals**

64. Which of the following cases would not require initiation of HIV treatment?
    A. CD4 count less than 300
    B. Pregnancy
    C. Patient diagnosed with PCP
    D. All of the above are cases where HIV treatment should be initiated

    Low CD4 count, pregnancy, or an AIDS-defining illness are all examples of times when HIV treatment should be initiated.

65. Which of the following is considered a thiazide-like diuretic often used to augment fluid loss in the treatment of congestive heart failure?
    A. Bumetanide
    B. Triamterene
    C. Metolazone
    D. Ethacrynic acid

    Bumex (bumetanide) and ethacrynic acid are loop diuretics. Triamterene is a potassium-sparing diuretic. Metolazone is a thiazide-like diuretic.

66. What is the half-life of a medication if the concentration at 8 AM is 16 mg/L and 12 hours later at 8 PM the concentration is at 2 mg/L?
    A. 1 hour
    B. 2 hours
    C. 3 hours
    D. 4 hours

    The half-life of a medication is the time required for the concentration or amount to decrease by half its initial value.

    The initial concentration is 16 mg/L. One half-life later, the concentration would be 8 mg/L. The concentrations at the second and third half-life would be 4 mg/L and 2 mg/L. This means that it takes 3 half-lives (and 12 hours) to go from 16 mg/L to 2 mg/L.
    12 hours divided by 3 half-lives = **4 hours per half-life**

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67. Who may be eligible for PrEP therapy?
    A. Person who has had vaginal or anal sex (with inconsistent condom usage) in the last 6 months with a partner of unknown HIV status
    B. Person who uses injectable drugs (illicit substances) and shares injection equipment
    C. Person who has been diagnosed with gonorrhea or syphilis in the past 6 months
    D. All the above

    According to the US Public Health Service, all of the persons described above could be considered for PrEP therapy to prevent HIV infection.

68. Which of the following is a common complication with the use of paclitaxel?
    A. Retinopathy
    B. Neuropathy
    C. Rash
    D. Cystitis

    Paclitaxel is a chemotherapy drug that can cause damage to the peripheral nerves, leading to neuropathy, a condition that is characterized by symptoms such as tingling, numbness, pain, and weakness.

69. A primary provider is asking you for your opinion on which would be the most appropriate antihypertensive in a patient who has frequent gout flares. Which would be least appropriate?
    A. Metoprolol
    B. Lisinopril
    C. Chlorthalidone
    D. Clonidine

    Thiazide diuretics can elevate uric acid and potentially contribute to gout flares. For this reason, chlorthalidone should be avoided in patients that have uncontrolled gout/frequent flares (if possible).

70. A 45-year-old male presents to the clinic with an inflamed and extremely painful left big toe. Recent labs reveal: Creatinine = 1.1 mg/dL, BUN = 19 mg/dL, hemoglobin =15 g/dL, platelets = 324,000/uL, uric acid = 13 mg/dL, potassium = 4.3 mEq/L, and sodium = 136 mEq/L. What medication would you use to treat this patient's pain?
    A. Allopurinol
    B. Indomethacin
    C. Tylenol
    D. Methotrexate

    Based on patient presentation (extreme pain located in the big toe plus elevated uric acid levels) this is likely an acute gout flare. Allopurinol is used for uric acid-lowering therapy and it will not help with the acute pain in this situation. NSAIDs (such as indomethacin) are used to treat acute gout pain. Steroids or colchicine are other options in the event of NSAID contraindication.

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71. Which of the following medications should not be used in a patient who has a stated sulfa allergy?
    A. Unasyn
    B. Levaquin
    C. Septra
    D. Doxycycline

    Unasyn is a combo of ampicillin/sulbactam. Septra is sulfamethoxazole and trimethoprim (also known as Bactrim) and should not be used in a patient with a sulfa allergy.

72. What is the mechanism of action of Xarelto?
    A. Inhibits Factor Xa
    B. Bind to ADP receptors on platelets
    C. Direct thrombin inhibitor
    D. None of the above

    Xarelto produces its anticoagulant effect by inhibiting factor Xa.

73. Which of the following medications would most likely increase the risk of deep vein thrombosis (DVT)?
    A. Lopressor
    B. Premarin
    C. Diclofenac
    D. Probenecid

    Premarin is an estrogen product and poses the greatest likelihood for increasing the risk of DVT.

74. Questran causes drug interactions primarily via what mechanism?
    A. CYP3A4 inhibition
    B. P-glycoprotein inhibition
    C. Blocking absorption in the gut
    D. Reducing elimination via the kidney

    Questran (cholestyramine) is a lipid lowering agent that binds to bile acids (metabolites of cholesterol) in the intestinal lumen and prevents their reabsorption. Due to the mechanism of action, patients should take other drugs at least 1 hour before or 4 hours after bile acid sequestrants to avoid impeding their absorption.

75. Which of the following statins can be considered high-intensity lipid lowering agents? Select all that apply.
    A. Atorvastatin
    B. Simvastatin
    C. Pravastatin
    D. Rosuvastatin

    Answers A, D.

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Atorvastatin (40-80 mg) and rosuvastatin (20-40 mg) are the only options that can be considered high-intensity lipid lowering agents.

76. Which of the following medications is used to stimulate the production of white blood cells following chemotherapy?
    A. Aranesp
    B. Erythropoietin
    C. Remicade
    D. Neupogen

    Neupogen (filgrastim) is a colony stimulating factor (CSF) used to help treat neutropenia. Aranesp (darbepoetin) and erythropoietin are used to treat anemia and stimulate the production of red blood cells. Remicade (infliximab) is an immunosuppressant used for treating inflammatory conditions (e.g., arthritis, ulcerative colitis).

77. According to the DEA, which medication has the lowest potential for abuse?
    A. Ativan
    B. Methadone
    C. Ritalin
    D. Kadian

    Kadian (extended-release morphine), Ritalin (methylphenidate) and methadone all are schedule 2 controlled substances. Ativan (lorazepam) is a schedule 4 controlled substance and would therefore have the lowest potential for abuse.

78. Which of the following is LEAST likely to be a symptom of opioid withdrawal?
    A. Anxiety
    B. Nausea
    C. Constipation
    D. Sweating

    Constipation is not likely to be a symptom of opioid withdrawal (diarrhea is more likely).

Answer the following three questions based on the following case:

A 67-year-old African American male has a history of hypertension and bipolar disorder. He is currently taking hydralazine, hydrochlorothiazide, loratadine and lithium. He has been feeling a little off lately. Labs/vitals reveal: Creatinine = 1.1 mg/dL, potassium = 4.0 mEq/L, sodium = 142 mEq/L, TSH = 17.4 mIU/mL, lithium 0.9 mEq/L, BP = 156/78 mmHg

79. What medication is most concerning in regards to the lab work and new symptoms.
    A. Hydralazine
    B. Lithium
    C. Hydrochlorothiazide
    D. Loratadine

    Lithium is concentrated within the thyroid and can inhibit thyroid synthesis and release which can lead to hypothyroidism. Based on the elevated TSH level and normal lithium level the patient is most likely experiencing symptoms of hypothyroidism.

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Thyroid function should be assessed before the initiation of lithium treatment, at three months and every six to twelve months while treatment is ongoing. If serum thyroid tests warrant concern, monitoring should occur more frequently.

From the labs, this patient is likely experiencing changes in thyroid function due to the lithium. TSH should be monitored with lithium (amiodarone is another classic drug that can affect thyroid function).

80. Of his other medications, which medication would be most likely to cause lithium levels to rise?
A. Hydralazine
B. Loratadine
C. Hydrochlorothiazide
D. None of the above would interact

Diuretics increase the excretion of sodium in the urine, leading to a decrease in blood sodium concentration. This can cause an increase in the reabsorption of sodium and lithium in the kidneys since the body tries to conserve these electrolytes. Diuretics can also cause a decrease in extracellular fluid volume, triggering the release of hormones that regulate the reabsorption of sodium and water in the kidneys, which can also affect the reabsorption of lithium. As a result, the net effect of diuretics on serum lithium concentrations is an increase in lithium reabsorption in the kidneys, which can lead to an accumulation of lithium in the body and an increase in serum lithium concentrations. Close monitoring of serum lithium levels is necessary in patients taking both diuretics and lithium, and medication regimens may need to be adjusted accordingly.

81. In the above case, which blood pressure medication would be most appropriate to replace hydralazine?
A. Lisinopril
B. Amlodipine
C. Losartan
D. Aliskiren

Given that the patient is an African American male and is already receiving a thiazide diuretic, replacing hydralazine with a calcium channel blocker (such as amlodipine) is the most appropriate option.

Additionally, addition of an ACE inhibitor or ARB in a patient on lithium could cause elevated lithium levels.

82. Which of the following statins is least likely to be involved in a drug interaction?
A. Atorvastatin
B. Simvastatin
C. Pravastatin
D. Rosuvastatin

Pravastatin is the only agent listed that is not metabolized by CYP enzymes. Compared to the other statins, it is least likely to be involved in a drug interaction.

83. Which of the following medications is used to treat hyperkalemia?
A. Sodium polystyrene sulfonate

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B. Vitamin K
C. PhosLo
D. Calcitriol

Often referred to as Kayexalate, sodium polystyrene sulfonate is used in the treatment of hyperkalemia.

A 25-year-old patient presents to your pharmacy stating she has a head cold and that she has been using Afrin for about 2 days since the symptoms started. She is not experiencing any benefit for her nasal congestion. She has no fever and she rates the pain at 2 on a scale of 1-10.

84. You should:
A. Recommend an oral nasal decongestant
B. Recommend a follow up with her primary physician
C. Recommend trying it for at least 5-10 days before switching if no relief in that timeframe, then see her primary physician
D. Recommend a mucolytic agent to take with Afrin for up to 10 days

Based on the patient's presentation, self-treatment with OTC options is reasonable.

Rebound congestion occurs with nasal spray decongestants (after 3-5 days of use) and not with oral nasal decongestants because of the way that nasal spray decongestants work and are absorbed in the body.

Nasal spray decongestants work by constricting the blood vessels in the nasal tissues, which reduces the inflammation and swelling that causes congestion. However, with prolonged use, the blood vessels can become dependent on the medication to maintain their constriction, and when the medication is discontinued, the blood vessels rebound and dilate, leading to worsening congestion.

In contrast, oral nasal decongestants, such as pseudoephedrine, work by constricting the blood vessels throughout the body, including those in the nasal tissues. Since these medications are absorbed systemically, they do not have the same localized effect on the nasal tissues as nasal spray decongestants. Therefore, they are less likely to cause rebound congestion.

85. Which of the following is least likely to alleviate acute respiratory symptoms in COPD?
A. Albuterol
B. Xopenex
C. Flovent
D. Ipratropium

Flovent is an inhaled corticosteroid. Remember that inhaled corticosteroids are controller type medications that reduce inflammation and will not work quickly to alleviate acute respiratory distress.

86. Which of the following is false regarding Lidoderm patches?
A. Should be removed every 24 hours
B. Can be cut
C. You can use more than one patch at a time
D. They are meant to be placed at the location of the pain

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The recommended administration is 12 hours on, 12 hours off. Leaving on for 24 hours is not recommended.

87. A 2-year-old male patient is diagnosed with acute otitis media – what is the recommended first line treatment?
    A. Levofloxacin
    B. Amoxicillin
    C. Bactrim
    D. Keflex

    Amoxicillin is effective against the most common bacterial pathogens that cause acute otitis media. It is generally well-tolerated and has a low incidence of side effects in children. Levofloxacin, Bactrim, and Keflex are not recommended as first-line treatments for acute otitis media in children due to their potential side effects and lower efficacy against the most common bacterial pathogens causing this condition.

88. A 33-year-old female has a history of hypertension, GERD, and depression. Current medications include: omeprazole, lisinopril, TUMS (as-needed), and Zoloft. She just found out that she is pregnant. Which of the following medications should be discontinued immediately?
    A. Lisinopril
    B. Omeprazole
    C. Tums
    D. Zoloft

    Lisinopril is contraindicated in pregnancy due to the risk for fetal abnormalities and should be discontinued immediately. The other medications are generally considered safe during pregnancy (under medical supervision) but all medication use should still be assessed and discussed.

89. Which of the following medications works by selectively inhibiting serotonin reuptake inhibitors in the treatment of depression?
    A. Effexor
    B. Cymbalta
    C. Luvox
    D. Elavil
    Luvox (fluvoxamine) is the only SSRI listed: Effexor (venlafaxine) and Cymbalta (duloxetine) are SNRIs and Elavil (amitriptyline) is a TCA.
90. A patient presents with symptoms of edema in his legs. Medications include: amlodipine, lisinopril, ibuprofen, and gabapentin. Which medication would LEAST likely be the cause of the peripheral edema?
    A. Amlodipine
    B. Lisinopril
    C. Ibuprofen
    D. Gabapentin

    Of the listed medications, lisinopril is least likely to be the cause of peripheral edema.

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Answer the following two questions based on the scenario below.

An exhausted mother is with her 8 month old child. She has been crying and just got back from the physician's office in which they told her to use OTC pain meds as she is just teething. The 8 month old has no known allergies and is 16 lbs.

91. What would you recommend?
    A. Ibuprofen 200 mg every 6 hours as needed
    B. Ibuprofen 50 mg every 6 hours as needed
    C. Ibuprofen 20 mg every 6 hours as needed
    D. Ibuprofen 100 mg every 6 hours as needed

    Dosing of ibuprofen is 5-10 mg/kg/dose
    16 lbs. = 7.26 kg
    7.26 kg x 5-10 mg/kg gives a range of 36.3-72.6 mg per dose. Of the available options, 50 mg every 6 hours as needed is the most appropriate dosing.

92. With her stuffy nose, she is having an occasional cough. Her mother would like an option to help with this. What is the best recommendation?
    A. Pseudoephedrine
    B. Diphenhydramine
    C. Dextromethorphan
    D. Cough Drops
    E. None of the above

    Answer – E, the cough does not appear to be very significant. Treating mild to moderate cough in infants with over the counter systemic agents is not recommended. Cough drops would not be appropriate for an 8 month old.

93. A 55-year-old male is diagnosed with Lyme's disease. What is the most appropriate initial treatment?
    A. Valtrex
    B. Vancomycin
    C. Doxycycline
    D. Clindamycin

    Doxycycline is typically the first line treatment for Lyme's disease.

94. Which bacteria is associated with the highest incidence of causing UTIs?
    A. S. pneumoniae
    B. S. aureus
    C. P. aeruginosa
    D. E. coli

    E. coli is the most common cause of UTIs.

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95. A 44-year-old male is on the following medications: hydrochlorothiazide, tramadol, quetiapine, and Prozac. He has had a weight gain of 20 pounds in the last 6 months. Which medication is the most likely cause?
    A. Hydrochlorothiazide
    B. Tramadol
    C. Quetiapine
    D. Prozac

    Antipsychotics as a class can contribute to metabolic syndrome, weight gain and increase the risk for developing diabetes. Antidepressants, such as SSRIs, can cause weight gain, but generally less so than antipsychotics. Quetiapine is the most likely cause.

96. Which of the following immunizations is recommended annually for patients greater than 65? Select all that apply.
    A. Pneumococcal
    B. Influenza
    C. Varicella
    D. Prevnar

    Influenza is the only one that is recommended annually.

97. A fast metabolizer via CYP3A4 would expect what effect on concentrations of erythromycin versus the normal population?
    A. Higher
    B. Lower
    C. No change
    D. None of the above

    Erythromycin is primarily broken down via CYP3A4. A fast metabolizer of CYP3A4 will break down the drug faster, leading to lower concentrations compared to the general population.

98. What is the primary mechanism of action of famotidine?
    A. Blocks Histamine type 1 receptors
    B. Blocks proton pumps in the GI tract
    C. Coats the lining of the stomach to produce its antacid effects
    D. None of the above

    Famotidine and the others are H2 receptor antagonists that work primarily in the stomach to reduce gastric acid secretion. H1 receptor antagonism is the mechanism of action of antihistamines, such as Benadryl and Claritin, which are used for managing allergy symptoms.

99. Which of the following is not a typical side effect of corticosteroids?
    A. Hyperglycemia
    B. GI upset
    C. Liver toxicity

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D. Insomnia

Liver toxicity would not be common with systemic corticosteroids. The others are very important side effects to remember when educating patients.

100. Which of the following is NOT a live vaccine?

A. Varicella
B. FluMist
C. Tdap
D. MMR

Tdap is the only one of the four that is not a live vaccine. It is important to remember given that immunocompromised patients should generally not receive live vaccines.

Answer the following four questions based on the case below:

A 61-year-old female has a history of osteoporosis, GI bleeding, knee osteoarthritis, gout, and hypertension. She presents to your pharmacy with worsening pain in her left knee. She hasn't taken anything to treat her pain at this point because she is scared that anything over the counter she takes will interact with her medications.

Her current medications include Fosamax, calcium with vitamin D supplement, losartan, metoprolol, allopurinol, prednisone, and hydrochlorothiazide.

101. What would be the most appropriate and effective long-term treatment for her osteoarthritis?

A. Ketorolac
B. Tramadol
C. Topical diclofenac
D. Acetaminophen

In this patient, it is preferable to use a topical product when pain is localized to help minimize the risk for systemic adverse effects. Ketorolac is an NSAID with a high risk for GI bleeding, which is not ideal given the patient's medical history. Additionally, it can only be used for up to 5 days consecutively, which makes it a poor option when chronic use is necessary. Tramadol may be considered down-the-line, but is generally not a first-line treatment option. Acetaminophen has fallen out of favor for use in osteoarthritis due to a lack of efficacy.

102. Which medication in her list has the greatest potential to elevate uric acid?

A. Prednisone
B. Hydrochlorothiazide
C. Losartan
D. Fosamax

Hydrochlorothiazide has the greatest potential to elevate uric acid levels among the medications listed. Thiazide diuretics, such as hydrochlorothiazide, increase uric acid levels by reducing the excretion of uric acid by the kidneys. Both ACE inhibitors and ARBs (such as losartan) can affect the renal system, which may lead to decreased excretion of uric acid and subsequent increases in serum uric acid levels. However, the effect of these medications on uric acid levels is generally considered to be small. Fosamax (alendronate) is not expected to affect uric acid levels.

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103. Out of the following medications, which is most likely to cause increases in calcium levels?

A. Hydrochlorothiazide
B. Losartan
C. Prednisone
D. Tylenol

Thiazide diuretics (such as hydrochlorothiazide) can cause an increase in calcium levels by increasing renal tubular reabsorption of calcium. This is different from loop diuretics, which can lead to decreased calcium levels by enhancing renal excretion.

104. What is the primary mechanism of action of Fosamax?

A. Stimulates osteoblast activity
B. Inhibits osteoblast activity
C. Increases production of endogenous vitaminD
D. Inhibits osteoclast activity

Bisphosphonates (such as alendronate) inhibit osteoclast activity. Remember that osteoclast activity essentially leads to the breakdown of bones and osteoblasts" "build" bone.

105. Which one of the following would be most appropriate in a patient reporting symptoms of depression and neuropathy?

A. Zoloft
B. Elavil
C. Duloxetine
D. Trazodone

Of the medications listed, duloxetine would be the most appropriate for a patient reporting symptoms of depression and neuropathy. Duloxetine is a serotonin-norepinephrine reuptake inhibitor (SNRI) that is approved for the treatment of depression and several types of neuropathic pain, including diabetic peripheral neuropathy.

Elavil (amitriptyline) is a tricyclic antidepressant (TCA) that is sometimes used for the treatment of neuropathic pain, but it has a higher risk of side effects compared to other medications, particularly in older adults.

Zoloft (sertraline) is a selective serotonin reuptake inhibitor (SSRI) that is primarily used for the treatment of depression and anxiety disorders, but it is not typically used for neuropathic pain.

Trazodone is another antidepressant that is sometimes used for the treatment of depression and insomnia, but it is not typically used for neuropathic pain.

106. Which of the following is the most common side effect of interferon beta-1a.

A. Loose stools
B. Flu-like symptoms
C. Leukopenia
D. Dry mouth

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Interferon beta-1a is a medication used to treat multiple sclerosis, and it works by reducing inflammation in the central nervous system. However, it can also cause a range of side effects, the most common of which are flu-like symptoms such as fever, chills, headache, muscle aches, and fatigue. These symptoms can be managed with acetaminophen or nonsteroidal anti-inflammatory drugs (NSAIDs) taken prior to the injection and continued as needed for several days afterwards.

107. KL is a 47-year-old female with a history of smoking and obesity. She presents to the emergency department with an acute ischemic stroke. She is in hypertensive crisis, BP 201/115 mmHg, but otherwise eligible for alteplase therapy. Which of the following agents would be most appropriate to initiate to safely lower her blood pressure < 185/110 mmHg?

A. Nitroglycerin
B. Labetalol
C. Hydralazine
D. Nitroprusside

The 2019 Update to the AHA/ASA Acute Ischemic Stroke Guidelines lists labetalol, nicardipine, clevidipine, hydralazine and enalapril as therapeutic options to lower blood pressure in patients eligible for thrombolytic therapy. Of the listed agents, labetalol is the most appropriate selection.

Labetalol is preferred over hydralazine for lowering blood pressure in patients with acute ischemic stroke because it has a more predictable and stable blood pressure-lowering effect. Labetalol is a nonselective beta-blocker with alpha-blocking properties, which makes it effective in lowering blood pressure without causing reflex tachycardia. On the other hand, hydralazine is a direct-acting vasodilator that can cause reflex tachycardia and increase myocardial oxygen demand, which can be harmful in patients with acute ischemic stroke. Additionally, labetalol has been shown to be more effective than hydralazine in achieving rapid blood pressure control in patients with acute ischemic stroke. Therefore, labetalol is the preferred agent for blood pressure control in patients with acute ischemic stroke, especially those who are candidates for thrombolytic therapy.

108. A 21-year-old male presents to the emergency department with incredibly painful head and neck pain. Upon assessment by the primary provider, it is determined that he likely has bacterial meningitis. Which of the following would be the agent of choice to initiate (in addition to vancomycin)?

A. Clindamycin
B. Levofloxacin
C. Doxycycline
D. Ceftriaxone

For this patient, the use of vancomycin plus a third-generation cephalosporin (such as ceftriaxone) is the most appropriate empiric therapy for bacterial meningitis.

A 26-year-old female presents to your pharmacy questioning which medication she can take for a headache. In the discussion with her, she reveals that she has just found out that she is pregnant. Her current medications include Prozac, famotidine, Vitamin B6, and minocycline (for acne).

109. Which medication would you recommend that she stop taking today?

A. Prozac

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B. Famotidine
C. Vitamin B6
D. Minocycline

Minocycline should be stopped immediately in this scenario.

Minocycline is an antibiotic in the tetracycline class, which can cross the placenta and potentially harm the developing fetus. It has been associated with tooth discoloration, inhibition of bone growth, and other adverse effects in fetuses exposed to the medication during pregnancy.

In this scenario, the patient is using minocycline as a treatment for acne. There are topical acne treatments safe for use during pregnancy that can replace the minocycline (such as topical benzoyl peroxide).

Prozac (fluoxetine) is a selective serotonin reuptake inhibitor (SSRI) antidepressant that is generally considered safe to use during pregnancy. However, the decision to continue or discontinue Prozac should be made in consultation with the patient's healthcare provider, based on the individual patient's situation and needs.

Famotidine is a medication used to reduce stomach acid production, and vitamin B6 is a dietary supplement often used to alleviate nausea during pregnancy. Both are generally considered safe to use during pregnancy when taken as directed.

110. In pregnancy, what is vitamin B6 commonly used to treat?
A. Heartburn
B. Constipation
C. Nausea and vomiting
D. Minimize risk of hemorrhoids

B6 (pyridoxine) is commonly used to help manage morning sickness/nausea and vomiting associated with pregnancy.

Answer the following three questions regarding the following case:

A 55-year-old male with a history of atrial fibrillation, CHF, is diagnosed with tuberculosis. His primary provider places him on rifampin and isoniazid, ethambutol, and pyrazinamide. His other medications include Coumadin, Lasix, lisinopril, and metoprolol.

111. Given his isoniazid use, which black box warning exists for this medication?
A. Kidney failure
B. Hepatitis
C. Thrombocytopenia
D. Increased risk of pancreatic cancer

Isoniazid is notoriously known for hepatitis (sometimes fatal).

112. Which electrolyte change associated with Lasix would be incorrect?
A. Hypomagnesemia
B. Hypokalemia
C. Hyponatremia

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D. All of the above can result due to Lasix use

Lasix (furosemide) can cause a decrease in all these electrolytes. Lasix can also cause hypocalcemia.

113. When this patient has their rifampin discontinued, what will happen to Coumadin concentrations and INR?
    A. INR will go up and Coumadin concentrations will go up
    B. INR will go up and Coumadin concentrations will go down
    C. INR will go down and Coumadin concentrations will go down
    D. No change in either

    In this case, rifampin is a strong enzyme inducer. When this medication is initiated, it will likely cause a reduction in the concentration of Coumadin and a resulting drop in INR. When the drug is **discontinued**, Coumadin concentrations will likely go up, and the INR will follow.

114. Which of the following medications used for HIV has a warning for lactic acidosis and severe hepatomegaly?
    A. Efavirenz
    B. Abacavir
    C. Lopinavir
    D. Ritonavir

    Abacavir is a nucleoside reverse transcriptase inhibitor (NRTI) that has a warning for lactic acidosis and hepatomegaly. Lopinavir and ritonavir are protease inhibitors, with ritonavir used as a pharmacokinetic booster. Efavirenz is an non-nucleoside reverse transcriptase inhibitor (NNRTI).

Answer the following three questions based on the case:

A 69-year-old male recently fell at home and presents to the ER with significant back pain. He states that he took a couple of Tylenol before he came, but it hasn't done a thing to help his pain. Past medical history includes hypertension, mild CHF, and epilepsy. Current medications include Keppra, Dilantin, clonidine, and Zestril.

115. What would be the most appropriate recommendation to treat his acute pain?
    A. Fentanyl patch
    B. Oxycontin
    C. Tramadol
    D. Morphine

    Fentanyl patches are not meant for acute pain. Fentanyl patches take a long time to begin their analgesic properties. Oxycontin is a long acting product which is not the optimal choice for this patient. Tramadol would be a potential option, but the seizure history would discourage us from using it. Morphine would be the best choice given the options.

116. If we used an NSAID in the above case, which of the following should be limited to use no longer than 5 days?
    A. Ketorolac
    B. Ibuprofen
    C. Nabumetone
    D. Piroxicam

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Ketorolac should be limited to 5 days due to GI bleed risk.

117. Which of the following vitals would be important in assessing fall risk in this patient?
A. Blood pressure
B. Dilantin Level
C. Timing and location of fall
D. All of the above

All of the above should be assessed as well as fall history, recent medication changes, etc. Dilantin (phenytoin) can cause impaired coordination and drowsiness, which can contribute to fall risks.

118. A 66-year-old female is 165 cm tall, weighs 198 pounds, and is enrolled in an investigation trial for a new cancer medication. The daily dose is 25 mg/kg and is dosed by ideal body weight. What dose should she be given?
A. 2,225 mg
B. 1,125 mg
C. 1,425 mg
D. 1,550 mg

165 centimeters is about 5 feet 5 inches. This is a female patient, so the female ideal body weight equation should be used: 45.5 kg + (2.3 kg X 5) = 57 kg. 57 kg X 25 mg/kg = **1425 mg**

119. How many vials of 80 mg/2 mL (2 mL vials) tobramycin would be required if a provider asks for a 6 mg/kg dose for a female patient weighing 189 lbs?

Fill in the Blank: **7 vials**

First, figure out the patient's weight in kilograms: 189 lbs/2.2 kg = 85.7 kg
Then figure out how many mg of tobramycin is required: 85.7 kg X 6 mg/kg = 514 mg
Then use the concentration to figure out the required volume: 80 mg/2 mL = 40 mg/mL; therefore, 514 mg/(40 mg/ml) = 12.85 ml of tobramycin solution
12 mL is insufficient. Each vial is 2 mL, so the next lowest volume available is 14 mL. 14 mL x (1 vial/2 mL) = **7 vials** are required to fill this order as is.

120. A patient presents a prescription for an infant. The order calls for 15 grams of 0.3% hydrocortisone cream. The pharmacy has a stock 1% hydrocortisone cream and cold cream. How much hydrocortisone 1% cream is needed to make 15 grams?

Fill in the Blank: **4.5 grams**

First figure out how much hydrocortisone is needed: 15 grams of the 0.3% product corresponds to [15 g x (0.3 g/100 g)] = 0.045 grams or 45 mg of hydrocortisone.

In each gram of hydrocortisone 1% contains 10 mg of hydrocortisone (or 0.01 grams), and 0.045 g of hydrocortisone is required. Therefore, 0.045 g hydrocortisone x (1 g/0.01 g) = **4.5 grams** (correct answer) of 1% hydrocortisone is needed for the final product. If the question were asking for the quantity of cold cream, subtract 4.5 g of hydrocortisone 1% from the 15 g total to get to a final quantity of 10.5 grams.

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121. A cardiac patient is prescribed lidocaine at a dose of 3 mg/min. The pharmacy has in stock a 250 mL bag of 0.8% lidocaine solution. Approximately how many hours will it take for this bag to be used up, rounded up OR down to the nearest hour?

Fill in the Blank: **11 hours**

0.8% = 0.8 g per 100 mL = 8 mg per mL
Converting 3 mg/min to flow rate in mL/min: 3 mg/min x (1 mL/8 mg) = 0.375 mL/min
Use the flow rate and the volume of the bag (250 mL) to calculate the answer in minutes: 250 mL x (1 min/0.375 mL) 667 minutes. The required unit of the final answer is in hours: 667 min x (1 hr/60 min) = **11 hours**.

Answer the following three questions based on the following case:

A 69-year-old female patient has a history of kidney disease, DVT, hypertension, neuropathy, and back spasms, currently receiving the following medications: Coumadin, metoprolol, gabapentin, cyclobenzaprine, and Cymbalta. She presents to the pharmacy with her recent lab values as well:
Potassium = 4.5 mEq/L
Sodium = 138 mEq/L
Chloride = 106 mEq/L
Serum Creatinine = 1.9 mg/dL
Weight = 156 lbs
INR = 2.1
Hemoglobin = 14.1 g/dL

122. Which medication is primarily eliminated via the kidney?
A. Coumadin
B. Gabapentin
C. Cyclobenzaprine
D. Cymbalta

Gabapentin only undergoes minimal metabolism and is eliminated primarily via the kidneys. Gabapentin dosing should be watched closely in a patient with a history of kidney disease, especially with changes in kidney function, as gabapentin can accumulate.

123. Gabapentin requires a transporter to cross the GI tract. As the dose increases and this transporter gets saturated, what can potentially happen?
A. As the dose increases, the neuropathic pain could increase
B. As the dose increases, the physiological response may be proportionally less
C. As the dose increases, total serum concentrations can go down
D. As the dose increases, the serum concentrations go disproportionally higher

As the dose of gabapentin is increased, a lower overall percentage of that dose will be absorbed due to transporter saturation. This leads to a proportionally smaller increase in concentration compared to increase in dose. Note that this does not mean a lower total quantity.

Interestingly, phenytoin can behave the opposite way due to liver enzyme saturation –

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concentrations can go up disproportionally faster once a certain threshold is reached. That is why it comes in 30 mg dosage forms.

124. What is the mechanism of action of cyclobenzaprine?

A. Reduces tonic somatic motor activity
B. Serotonin and Norepinephrine Reuptake Inhibitor
C. Enhances inhibitory effect of GABA
D. Blocks sodium channels, inhibiting depolarization

Option A describes cyclobenzaprine. Option C describes benzodiazepines. Option D describes Lidoderm (lidocaine).

125. JT's primary care provider believes he has Addison's disease. He hasn't been told much about his condition, and he wishes to know what the usual treatment of this disease is. What is the best response?

A. Spironolactone
B. Hydrocortisone
C. Avoid all corticosteroids as they can cause medication-induced adrenal insufficiency
D. Propranolol
E. Phenytoin for seizure prophylaxis

Answer – B Addison's disease is characterized by a lack of endogenous cortisol and other similar precursors. It is treated with exogenous steroids like hydrocortisone. Propranolol, phenytoin, and spironolactone are not used in the treatment of Addison's. It may help to remember that Addison's is essentially the opposite of Cushing's, which can be caused by excessive, long term doses of corticosteroids.

126. A patient presents to your pharmacy with a new prescription for Zyban to help with smoking cessation. You note that she has a history of high blood pressure, smoking, MS, seizures, and anxiety. Which disease state could be significantly exacerbated by this order?

A. MS
B. High blood pressure
C. Anxiety
D. Seizures

Although other conditions listed may also potentially be affected on rare occasions, Zyban (bupropion) is known to lower seizure threshold (i.e., increases the risk of having a seizure). Therefore, this medication should not be used.

127. A 44-year-old male was recently diagnosed with mild non-purulent cellulitis. Which of the following is the most appropriate empiric therapy?

A. Vancomycin
B. Dicloxacillin
C. Ceftriaxone
D. Zosyn

According to the 2014 IDSA Guidelines for Skin and Soft Tissue Infection, for mild non-purulent cases of cellulitis the use of oral antibiotics with MSSA coverage (such as dicloxacillin) are recommended. The other agents would not be appropriate for this mild case of cellulitis.

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128. Which of the following ethnic groups is potentially at a higher risk of SJS from Tegretol?

A. Asians
B. White females
C. Blacks
D. Hispanics

The risk of Stevens Johnson syndrome (SJS)/toxic epidermal necrolysis (TEN) from carbamazepine is significantly increased in patients positive for the HLA-B*1502 allele. This allele is strongly associated with ancestry across broad areas of Asia, including South Asian Indians. (from FDA website)

129. Which of the following is not true in regards to changes in pharmacokinetics in the general elderly population?

A. Decreased volume of distribution for lipophilic medications
B. Decreased kidney function
C. Age generally does not affect conjugation (phase 2 reactions) via the liver
D. Decreases in albumin can affect drugs like Dilantin

In elderly patients, the volume of distribution generally increases for lipophilic medications due to increase in body fat. Kidney function and albumin both can decline. Remember LOT (lorazepam/oxazepam/temazepam) undergo phase 2 reactions and are less likely to accumulate in the elderly.

130. Which of the following is NOT an important side effect to monitor for with amphotericin B?

A. Infusion reaction
B. Nephrotoxicity
C. Neurotoxicity
D. Chills

Neurotoxicity is not a likely side effect of Amphotericin B

131. What is a potential disadvantage of DOACs compared to warfarin? (Select all that apply)

A. Direct cost
B. Diet changes can impact blood concentrations
C. More drug interactions
D. Twice daily dosing for some
E. Inability to assess for adherence through blood levels

Answer – A, D, and E are all potential disadvantages. They are generally more expensive than warfarin, and some require twice daily dosing (apixaban, dabigatran). Unlike warfarin, which can be routinely monitored for adherence by measuring INR, there currently is no effective way to assess adherence to DOACs (other than patient reports and refill history).

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Answer the following two questions based on the case:

A 41-year-old female has a history of hypertension, smoking, and asthma. Current medications include: Ortho Tri Cyclen for birth control, nifedipine, varenicline, nicotine gum as needed, and albuterol as needed. She has been complaining of abnormal dreams of late.

132. Which medication would you likely suspect to be contributing to these symptoms?
A. Ortho Tri Cyclen
B. Nifedipine
C. Varenicline
D. Nicotine

Varenicline (Chantix) is known for causing abnormal dreams.

133. Which of the following would put her at increased risk of a blood clot? Select all that apply
A. Age
B. Ortho Tri Cyclen
C. Smoking
D. Asthma

The patient's diagnosis of asthma would not put her at increased risk of a blood clot. Ortho Tri Cyclen should be reassessed given her other risk factors (age, smoking) for clotting.

134. Which of the following is not true in regards to the use of vancomycin?
A. Oral and parenteral bioavailability differences are negligible
B. Patients should be monitored for vancomycin flushing syndrome
C. Kidney function should be monitored
D. Trough concentrations are often monitored to direct therapy

Oral vancomycin is poorly absorbed and is mostly confined to the GI tract. As such, it is usually only used to treat C. difficile infections.

135. Match the medications to the correct site of action in the nephron.

1. Chlorthalidone
2. Bumetanide
3. Spironolactone
4. Acetazolamide

A. Ascending Loop of Henle
B. Distal convoluted tubule
C. Collecting duct
D. Proximal convoluted tubule

Answer - 1:B, 2:A, 3:C, 4:D

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136. Which of the following NSAIDs is available as a topical formulation?

A. Indomethacin
B. Diclofenac
C. Meloxicam
D. Sulindac

Diclofenac (Voltaren) is available as a topical NSAID product.

137. A patient is switching from Dilantin (total daily dose of 300 mg) daily extended release capsules to the liquid suspension (total daily dose of 300 mg). Which of the following would be an incorrect educational point on the use of Dilantin?

A. It is critical for patients to not miss doses
B. Seizure risk increases even with normal total Dilantin levels in with low albumin
C. Chronic Dilantin can contribute to vitamin D deficiency
D. Signs of toxicity include GI upset, Ataxia, slurred speech, and lethargy

Patients with low albumin levels have higher fraction of unbound phenytoin (Dilantin) and are therefore at a higher risk of phenytoin toxicity, not seizure. Recall that there is a correction method to account for this difference.

138. Which of the following is not an inhibitor of CYP3A4?

A. Grapefruit juice
B. Erythromycin
C. Diflucan
D. St. John's Wort

St. John's Wort is an inducer of CYP3A4, not an inhibitor.

139. What is the mechanism of action for Comtan?

A. COMT inhibitor
B. MAOI
C. Dopamine Agonist
D. Acetylcholinesterase Inhibitor

Comtan (entacapone) is an inhibitor of catechol-O-methyltransferase (COMT), an enzyme that metabolizes levodopa. Used as an adjunct in the treatment of Parkinson's disease, it helps sustain levodopa levels when used in combo with Sinemet.

140. Which of the following medications is indicated for diabetic gastroparesis?

A. Carafate
B. Reglan
C. Compazine
D. Omeprazole

Reglan (metoclopramide) is indicated for gastroparesis (a slowing of the gut transit time). A unique side effect of Reglan is that it can block dopamine, causing unwanted

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movement-related effects, especially in patients with preexisting movement disorders involving a lack of dopamine (e.g., Parkinson's disease).

141. Which of the following would likely exacerbate IBS with predominant diarrhea?
A. Dicyclomine
B. Lomotil
C. Elavil
D. Zoloft

Zoloft (sertraline, an SSRI) is very serotonergic and can increase the risk of exacerbating loose stools. Elavil (amitriptyline, a TCA) is highly anticholinergic, and is therefore constipating. Dicyclomine (an anticholinergic) can actually be used to treat IBS. Lomotil (diphenoxylate-atropine), a combination of a mu-opioid receptor agonist and an anticholinergic, is constipating as well.

142. A patient presents to the pharmacy not having taken his medications for two days as he forgot them when he left for vacation. Which one would likely be the highest risk to go without for 2 days? Tylenol 500 mg twice daily, metoprolol 100 mg BID, Xalatan 1 gtt OU HS, Lipitor 40 mg daily.
A. Metoprolol
B. Tylenol
C. Xalatan
D. Lipitor

Abrupt discontinuation of beta blockers, especially at higher doses, could potentially cause significant rebound hypertension/tachycardia. Of the listed medications, the highest priority would be to resume the patient's metoprolol again.

143. Which of the following would be indicated in the treatment of Graves' disease?
A. Methimazole
B. Prednisone
C. Hydroxyzine
D. Prochlorperazine

Graves' disease causes hyperthyroidism. Signs and symptoms of this disease include tachycardia, weight loss, increased osteoporosis risk, insomnia, and anxiety. Methimazole and propylthiouracil (PTU) are two medications that can treat Graves' disease. Beta blockers can be used for the treatment of acute thyroid storms.

144. What is a methacholine challenge used to help diagnose?
A. Parkinson's disease
B. Asthma
C. Multiple sclerosis
D. Diabetes

Methacholine is a cholinergic agonist which causes the airways to close up, making it

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difficult for patients with asthma to breathe. Remember that inhaled anticholinergics like ipratropium are used to help open up the airways.

145. Which of the following antibiotics has poor lung penetration and would greatly increase the risk of rhabdomyolysis?
A. Clindamycin
B. Daptomycin
C. Bactrim
D. Gentamicin

Daptomycin is indicated for skin and soft tissue infections, has activity against MRSA, poor lung penetration, and will increase the risk of rhabdomyolysis, especially with statin use.

146. For which of the following patients would a pneumococcal vaccine not need to be given?
A. 53-year-old male with only a history of osteoarthritis
B. 35-year-old female with moderate asthma
C. 63-year-old male with COPD
D. 69-year-old female with no comorbidities

CDC recommends pneumococcal vaccination for all adults 65 and older. CDC also recommends pneumococcal vaccination for adults 19 through 64 who have chronic lung disease, including asthma and COPD. A is the correct answer.

147. Which of the following study designs has the lowest statistical evidence behind it?
A. Cohort study
B. Case control study
C. Randomized controlled trials
D. Case study

Individual case studies are the lowest on the strength of evidence scale. Randomized controlled trials (RCTs) are the strongest evidence-based medicine studies – hence this is what is required for new drugs. RCTs are often difficult to conduct with rare diseases due to difficulty in enrolling enough patients to properly power the study.

148. The MedWatch program collects data from which of the following phase(s) of clinical trials?
A. Phase 1
B. Phase 2
C. Phase 3
D. Phase 4

MedWatch collects information from post marketing surveillance (also sometimes called phase 4). Phase 3 is the last phase of study before a medication is approved and released to the market.

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149. A 68-year-old female with a history of epilepsy and diabetes is currently receiving the following: phenytoin, carbamazepine, pioglitazone, and metformin. Recent labs revealed hyponatremia. Which medication is the most likely cause?
    A. Phenytoin
    B. Carbamazepine
    C. Pioglitazone
    D. Metformin

    Carbamazepine has the potential to cause hyponatremia.

150. A 65-year-old female presents with symptoms of weakness on one side and a noted facial droop. Symptoms started about 2 hours ago. The suspected diagnosis is a CVA. Currently, she is receiving warfarin and the INR was 2.3 upon checking. Is tPA appropriate?
    A. No, because symptoms started more than 90 minutes ago.
    B. No, because INR is currently 2.3
    C. Yes, give tPA now
    D. Yes, but give tPA when INR falls to less than 1.7

    The FDA-approved use of tPA (alteplase) for acute ischemic stroke is within 3 hours of symptom onset. Guidelines advise against using tPA (specifically, alteplase) for acute ischemic stroke in patients taking warfarin whose INR is greater than 1.7. Waiting for INR to fall below 1.7 is not an appropriate option as it will likely be too late at that point to administer tPA.

151. When a p-value is calculated in a clinical study, what is being determined?
    A. Probability of making a Type 1 error
    B. Probability of making a Type 2 error
    C. Probability that the difference observed is clinically significant
    D. Probability that the study is powered to detect statistical differences

    When the p-value is less than 0.05, this is generally considered the threshold of statistical significance. This translates to < 5% chance of the observed difference happening by chance alone (i.e., false positive). Type 1 error is detecting a difference when no difference truly exists.

152. A 46-year-old female is assessed with right knee pain. She was instructed a couple of weeks ago to try capsaicin cream for mild to moderate pain. Past medical history includes GI bleed and chronic kidney disease. She has tried it a few times when her knee was aching but reports that it has not been effective. The patient is asking for the pharmacist's recommendations.
    A. Keep using the capsaicin, but use at least three times daily for at least a few weeks
    B. Self treatment is not recommended at this point
    C. Recommend ibuprofen
    D. Recommend glucosamine/chondroitin

    Capsaicin should be applied on a consistent basis (3-4 times daily) to deplete substance P and produce analgesic effects. Capsaicin may take 2-4 weeks for effective pain relief. Ibuprofen is not recommended due to the patient's history of GI bleed and CKD. There is currently mixed evidence for the effectiveness of glucosamine/chondroitin for relief of knee pain.

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153. Choosing only patients with severely high blood pressure for a study on hypertension medication that will help you prove statistical significance is an example of:

A. Observational bias
B. Selection bias
C. Recall bias
D. Interviewer bias

Bias in the selection or choosing of participants in a study is selection bias.

154. Variables X and Y have a correlation coefficient of -0.0024. What does this mean?

A. There is very little correlation
B. As X increases, Y tends to increase as well
C. Y is a dependent variable
D. An error was made in calculation

Correlation coefficient ranges from +1 to -1, with +1 being complete positive correlation and -1 being complete inverse correlation. The given value is close to 0, which translates to very little correlation.

155. What is the distribution of water in the extracellular space?

A. 25/75 plasma/interstitial
B. 50/50 plasma/interstitial
C. 60/40 plasma/interstitial
D. None of the above

Extracellular fluid volume makes up about a third of the total body water. 75% of the extracellular fluid volume is found in the interstitial space, and the remaining 25% is found in the plasma.

156. Which antibiotic can be used to promote GI motility?

A. Levofloxacin
B. Moxifloxacin
C. Clarithromycin
D. Erythromycin

Due to its well known prokinetic properties, erythromycin can be used (off-label) for the management of gastroparesis.

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157. A 65-year-old patient with diabetes presents to the ED with symptoms of excessive thirst and lethargy. The patient appears confused. His spouse reports that he has been like this for the last few hours. She also reports that he hasn't been very good about taking his insulin recently and has also been "into the sweets" as they have been celebrating with family.

Labs:

- Blood glucose = 555 mg/dL
- Sodium = 134 mEq/L
- Potassium = 3.0 mEq/L
- Creatinine = 1.6 mg/dL
- pH = 7.23

Which of the following actions would be most appropriate to do first?

A. Initiate insulin
B. Initiate IV potassium replacement
C. Initiate oral hydration
D. Initiate sodium bicarbonate to raise pH

With ketoacidosis, the key is to correct the underlying hyperglycemia. However, if the patient is already hypokalemic with K < 3.3 mEq/L, potassium should be corrected before adding insulin (insulin can cause an intracellular shift of potassium and lead to profound hypokalemia). Hydration is recommended using intravenous saline 0.9% or 0.45%. Bicarbonate replacement is recommended in patients with pH < 6.9.

158. A 55-year-old male has been hospitalized for about 7 days following a recent hip surgery. He starts to develop increased coughing and a temperature of 38.2 degrees Celsius and is diagnosed with pneumonia. What is the most appropriate empiric pneumonia therapy?

A. Cefepime and gentamicin
B. Ertapenem
C. Piperacillin/tazobactam
D. Cefepime and linezolid

With no MRSA risk factors or mortality risk mentioned in the prompt, the best option is one guideline-recommended agent that covers *Pseudomonas* and MSSA.

159. A 36-year-old male present with intractable hiccups. What medication is indicated for the treatment of this?

A. Lorazepam
B. Levetiracetam
C. Propranolol
D. Chlorpromazine

Chlorpromazine is indicated for the treatment of intractable hiccups.

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160.Which of the following drugs is paired with an incorrect target/site of action?

A. Macrolide: 50S ribosomal subunit
B. Tetracycline: 30S ribosomal subunit
C. Beta-lactams: cell wall synthesis
D. Fluoroquinolones: DNA topoisomerase I & III

Fluoroquinolones bind to and inhibit topoisomerase II and IV (not I and III).

161. In oncology, which one of the following medication regimens is least likely to cause chemotherapy induced nausea and vomiting?

A. Dacarbazine
B. Doxorubicin (< 60 mg/m2)
C. Cisplatin
D. Vincristine

Dacarbazine and cisplatin are considered high emetic risk regimens. Doxorubicin is considered a moderate emetic risk regimen. Vincristine is considered to have minimal emetic risk.

162. A mother presents to the pharmacy with questions on different pain medications for her 8 month old infant. She believes her baby is teething and would like something to help with the pain. She will not use Tylenol as she is concerned that it will cause liver toxicity in her baby. Which of the following would be the best alternative?

A. Aspirin
B. Ibuprofen
C. Tramadol
D. None of the above

Ibuprofen would be an acceptable alternative to Tylenol in pediatrics for the management of pain and/or fever. There are infant suspensions available for the patient's age group. Aspirin should not be used over the counter in children younger than 12 years.

163. A patient with end stage COPD presents to your pharmacy with a sore throat and has just recently been to his primary care provider and has a prescription for Nystatin swish and swallow. His current medications include: Symbicort, DuoNeb, Spiriva, and Daliresp. Which medication would you like to reeducate this patient on first?

A. Symbicort
B. DuoNeb
C. Spiriva
D. Daliresp

Based on the prescription and the symptoms, this patient likely has thrush. Symbicort contains an inhaled corticosteroid, and patients should be counseled to rinse their mouth after each use in order to avoid thrush.

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Answer the following 3 questions based on the case below:

A 45-year-old male has a history of hyperlipidemia, gout, hypertension, and rheumatoid arthritis. His current medications include Lipitor, niacin, lisinopril, allopurinol, and methotrexate.

164. Which medication is most likely to exacerbate his gout?

A. Lipitor
B. Niacin
C. Methotrexate
D. Lisinopril

Niacin is notorious for flushing symptoms. Niacin can also cause elevated uric acid levels and potentially exacerbate gout

.

165. What is the mechanism of action for allopurinol?

A. Inhibits xanthine oxidase
B. Increases renal excretion of uric acid
C. Inhibits beta-tubulin polymerization in microtubules
D. Reduces inflammation via COX inhibition

Allopurinol inhibits xanthine oxidase; probenecid increases renal excretion of uric acid; colchicine inhibits beta tubulin polymerization; NSAIDs reduce inflammation via COX inhibition

166. Which of the following is a notable drug interaction that can occur when Lipitor and niacin are taken together?

A. Exacerbation of niacin-induced flushing
B. Muscle pain
C. Increase in triglycerides
D. Severe diarrhea

Concomitant use of niacin and atorvastatin can increase the risk of myopathy, especially during the initial months of therapy and any periods of upward dosage titration.

167. With respect to clinical trials, which of the following is true?

A. As sample size increases, power will increase as well
B. Bias most often increases the risk of type 2 error
C. Intention-to-treat analysis considers all subjects who received at least 1 dose of the test intervention
D. P-value threshold of 0.05 is generally used to determine clinical significance

As sample size increases, the power to detect a difference between the two groups increases as well. Type 2 error is not detecting a difference when there is one; type 1 error is detecting a difference when there isn't one in reality. Bias is more prevalent in type 1 errors. Intention-to-treat analysis considers all randomized subjects. P-value threshold of 0.05 is used to determine statistical significance, not clinical.

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168. Which of the following would not be an anticipated effect of epinephrine?
A. Increased heart rate
B. Anxiety
C. Headache
D. Hypotension

Epinephrine is a sympathomimetic agent that has both alpha- and beta-receptor activities. Epinephrine causes hypertension by inducing vasoconstriction.

169. What is the mechanism of action of cyclosporine used in organ transplantation?
A. Inhibits calcineurin
B. Inhibits inosine 5'-monophosphate dehydrogenase
C. Inhibits T-lymphocyte activation by binding to FKBP-12
D. Binds to intracellular receptors and affect gene expression to reduce inflammation

Options B, C, and D correspond to mycophenolate mofetil, tacrolimus, and corticosteroids, respectively.

170. An over the counter medication (solution) is 0.7% active ingredient. How many mg would be in a 30 cc bottle? Round to the nearest whole mg.

Fill in the blank: **210 mg**

Remember that 1% w/v is equal to 1 gram per 100 mL. Therefore, 0.7% indicates 0.7 grams of the active ingredient (700 mg) per 100 mL. The total volume given in the prompt is 30 mL (1 cc = 1 mL). 30 mL x (700 mg / 100 mL) = 210 mg of the active ingredient.

171. What is the primary mechanism of action of olanzapine in the treatment of schizophrenia?
A. Serotonin receptor agonist
B. Alpha receptor agonist
C. Norepinephrine reuptake inhibitor
D. Dopamine receptor antagonist

Antipsychotics generally block dopamine receptors as their primary mechanism. Olanzapine blocks D2 dopamine receptors and 5HT-2A serotonin receptors.

172. A 48-year-old male presents with an acute exacerbation of his rheumatoid arthritis. He is currently on methotrexate 7.5 mg weekly. Which of the following would be most appropriate to acutely relieve the pain symptoms?
A. Increase methotrexate
B. Add Tylenol
C. Add ibuprofen
D. Switch to hydroxychloroquine

Switching to another DMARD or increasing methotrexate may be considered long-term, but these actions will likely not relieve immediate symptoms. NSAIDs are preferred over Tylenol for

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managing rheumatoid arthritis because acetaminophen has no effect on inflammation.

Answer the following two questions - A 134 kg patient with chronic kidney disease has an order written for Aranesp 0.45 mcg/kg once weekly. The concentration in stock at the pharmacy is 25 mcg/0.42 mL.

173. How many mLs will be required to fill this order? Round to the nearest hundredth's place.

Fill in the blank: **1.01 mL**

Starting with the patient's weight: 134 kg X 0.45 mcg/kg = 60.3 mcg. Converting the total dose to mLs using the given concentration: 60.3 mcg x (0.42 mL / 25 mcg) = 1.01 mL.

174. Which of the following is a boxed warning for Aranesp?

A. Increased risk of severe hypercalcemia
B. Increased risk of severe hypocalcemia
C. Increased risk of serious cardiovascular events
D. Hypertensive crisis

Aranesp (darbepoetin alfa) is an erythropoiesis-stimulating agent (ESA). This agent is used to treat anemia and increase red blood cell production. This agent can increase the risk of serious cardiovascular events, especially when the hemoglobin level is greater than 11 g/dL. Aranesp can cause an increase in blood pressure, but this is not part of the boxed warning.

175. Which one of the following medications could be used in atrial fibrillation and hypertension?

A. Terazosin
B. Calan
C. Amlodipine
D. Lisinopril

Calan (verapamil) is a non-dihydropyridine calcium channel blocker. It can slow down the ventricular rate in atrial fibrillation treatment. Amlodipine is a dihydropyridine calcium channel blocker, which has greater selectivity for vascular smooth muscle cells than cardiac muscle cells (and therefore has no established use in atrial fibrillation). Terazosin is an alpha blocker, and lisinopril is an ACE inhibitor - neither of these agents are used to treat atrial fibrillation.

176. Which of the following would be most likely to interact with Coumadin and raise INR?

A. Metronidazole
B. Carbamazepine
C. St. John's Wort
D. Rifampin

Metronidazole, quinolones, and Bactrim are antibiotics that can raise INR when concomitantly used with warfarin. Carbamazepine, St. John's Wort, and rifampin certainly can interact with Coumadin, but they are enzyme inducers and would cause INR to go down when initiated or increased.

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177. Which of the following medications has the potential to cause both hyponatremia and hyperkalemia?
    A. Enalapril
    B. Hydrochlorothiazide
    C. Metoprolol
    D. Aldactone

    Enalapril can cause hyperkalemia but generally has no effect on sodium. Metoprolol is a beta blocker and generally does not affect electrolytes. Aldactone can cause hyponatremia and hyperkalemia. Hydrochlorothiazide can cause both hyponatremia and hypokalemia.

178. What is the mechanism of action of memantine?
    A. Dopamine agonist
    B. NMDA receptor antagonist
    C. Acetylcholinesterase inhibitor
    D. Neuraminidase Inhibitor

    Memantine (Namenda) is an NMDA receptor antagonist used in the treatment of dementia. Dopamine agonists used to treat Parkinson's disease include ropinirole and pramipexole. Acetylcholinesterase inhibitors used for dementia include rivastigmine and donepezil. An example of a neuraminidase inhibitor is oseltamivir, which is used for prophylaxis and treatment of influenza.

179. Which of the following is not an adverse effect of Vyvanse?
    A. Circulation problems
    B. Increased oral secretions
    C. Hypertension
    D. Growth suppression

    Vyvanse (lisdexamfetamine) is a CNS stimulant. It can cause dry mouth, not excessive salivation.

Answer the following three questions based on the information below:

A 49-year-old female presents to the pharmacy for a comprehensive medication review. She is currently on the following medications: doxepin, Senna-S, oxycodone, diltiazem, lisinopril, saliva substitute, artificial tears, Lumigan, and Restasis. Her current diagnoses include insomnia, constipation, pain, hypertension, xerostomia, and keratoconjunctivitis sicca.

180. She has a very busy schedule and would like to do all her eye drops at one time. What is the best response?
    A. Artificial tears, Lumigan, and Restasis should all be ok to be given consecutively
    B. She should wait at least 60 seconds between eye drops
    C. She should wait 5 minutes between eye drops
    D. She should wait at least 10-15 minutes between eye drops

    5 minutes is the recommended separation between eye drops when administering more than one.

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181. Which of the following medications is likely to exacerbate her xerostomia and keratoconjunctivitis sicca?
    A. Oxycodone
    B. Diltiazem
    C. Restasis
    D. Doxepin

    Doxepin is an older TCA and has anticholinergic properties. Of the given choices, doxepin is the most likely to exacerbate her xerostomia (dry mouth) and keratoconjunctivitis sicca (dry eyes).

182. What is the medication class of Lumigan?
    A. Alpha-2 receptor agonist
    B. Prostaglandin analog
    C. Beta-blocker
    D. Corticosteroid

    Lumigan (bimatoprost) is a prostaglandin analog used in the treatment of glaucoma. Timoptic (timolol) is an example of a beta-blocker, and Alphagan (brimonidine) is an example of an alpha-2 agonist. Corticosteroids are not used for the treatment of glaucoma, but for inflammation of the eye.

183. A 64-year-old female is receiving Oxycontin 80 mg twice daily for the management of back pain. She has been taking this medication for years, but has had some difficulty swallowing recently. The provider would like to switch Oxycontin to morphine oral solution. What would be the most appropriate equivalent conversion from Oxycontin 80 mg twice daily?
    A. 240 mg oral morphine per day
    B. 420 mg oral morphine per day
    C. 120 mg oral morphine per day
    D. 107 mg oral morphine per day

    Oxycodone's morphine equivalent conversion factor is 1.5; A is the best answer. When converting, it may be helpful to remember that oxycodone is more potent than oral morphine.

184. Which of the following is not an advantage of using Buspar over a benzodiazepine to treat anxiety?
    A. Buspar works relatively quickly
    B. Buspar has lower risk of abuse/addiction
    C. Buspar is better tolerated in the elderly
    D. Buspar is not a controlled substance

    For the treatment of anxiety, Buspar is similar to SSRIs in that it generally takes some time to be effective. Buspar will likely not work as well as benzodiazepines when used as needed.

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A concerned mother walks into the pharmacy and would like to pick up her daughter's prescription for oseltamivir. Upon questioning, you find out that her four-year-old daughter was recently diagnosed with influenza. Her daughter's weight is 45 lbs. Her daughter really struggles with breathing and the mother is having a difficult time with anxiety as well. The recommended dosing is as follows;

Oseltamivir Prophylaxis

- < 15 kg = 30 mg once daily
- 15.1-23 kg = 45 mg once daily
- 23.1-40 kg = 60 mg once daily
- ≥ 40.1 kg = 75 mg once daily

Oseltamivir Treatment

- < 15 kg = 30 mg BID
- 15.1-23 kg = 45 mg BID
- 23.1-40 kg = 60 mg BID
- ≥ 40.1 kg = 75 mg BID

185. Given the information above, calculate the appropriate dose for the daughter's oseltamivir.

Fill in the blank: **45 mg BID x 5 days**

The child's body weight in kilograms is 45 lb x (1 kg/2.2 lb) = 20.45 kg

186. Regarding the use of oseltamivir, which of the following is false?

A. Prophylaxis typically lasts 7-10 days
B. Treatment usually lasts 5 days
C. Oseltamivir inhibits neuraminidase as its primary mechanism of action
D. Oseltamivir requires dose adjustments for hepatic impairment but are not for renal impairment

Answer – D is false; oseltamivir requires dose adjustments for impaired renal function.

Answer the following two questions based on the following scenario. An elderly gentleman has recently had cataracts removed from his eyes and still has complaints of visual problems. His current medication list includes:

- Terazosin 2 mg at bedtime
- Methotrexate 15 mg once weekly
- Prednisone 5 mg daily
- Ramipril 10 mg daily

- Metoprolol tartrate 25 mg BID
- Aspirin 81 mg daily
- Etanercept 50 mg weekly

187. Which medication is most likely responsible for contributing to his cataracts?

A. Prednisone
B. Ramipril
C. Methotrexate
D. Terazosin

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Answer A – Long term use of corticosteroids like prednisone is one of the most common causes of drug induced cataracts.

188. Which of the following is the appropriate route of delivery for etanercept?
A. Oral
B. Intra-articular
C. IV infusion
D. Subcutaneous

Etanercept is administered via subcutaneous injection.

Answer the following two questions based on the information below.

A physician orders a 3mcg/kg/min drip of Drug A. This drug is typically put into a 250 ml bag of D5W. The patient's weight is 135 pounds.

189. How much Drug A in mg will this patient receive in 30 minutes? Round to the nearest tenth.

Fill in the blank: **5.5 mg in 30 minutes**

135 lbs X (1 kg/2.2 lb) = 61.4 kg
3 mcg/kg/min X 61.4 kg = 184.2 mcg/min
184.2 mcg/min X 30 minutes = 5,526 mcg
5,526 mcg (1 mg/1,000 mcg) = **5.5 mg in 30 minutes**

190. If the infusion ran continuously for 48 hours at the rate of 3 mcg/kg/min, how many bags of D5W, each containing 200 mg of Drug A, would the patient need?

Fill in the blank: **3 bags of 200 mg D5W**

Using the information in the question above,
184.2 mcg/min X (60 min/1 hour) X 48 hours = 530,000 mcg
530,000 mcg (1 mg/1,000 mcg) = 530 mg
200 mg per bag, this order would require **3 bags of 200 mg D5W**

191. Which of the following is false regarding the Cockcroft-Gault equation?
A. A rise in serum creatinine will estimate a decrease in creatinine clearance
B. A higher lean body weight will estimate a lower overall creatinine clearance
C. Blood urea nitrogen does not factor into this equation
D. As age increases, estimated creatinine clearance will decrease

Answer B.
The Cockcroft-Gault equation for estimating creatinine clearance (CrCl) is as follows:

$$eCrCl\ (mL/min) = \frac{(140 - age) \times (lean\ body\ weight\ in\ kg)}{(serum\ creatinine\ in\ mg/dL) \times 72} \times (0.85\ if\ female)$$

All of the above are true except B - a higher lean body weight will yield a higher estimated

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creatinine clearance.

Answer the following 2 questions based on the scenario below.

With an increase in shortness of breath, JS presents to the emergency department. He has noticed that swelling around his ankles has increased some over the last couple of days. He also reports frequent OTC naproxen use because of a sore back.

His other diagnoses include COPD, GERD, history of myocardial infarction, heart failure, and atrial fibrillation.

192. Which of the following monitoring parameters would be utilized to assess this patient for cardiac conduction abnormalities?

A. BNP
B. Chest X-Ray
C. Troponin
D. EKG

An EKG (electrocardiogram) would be utilized to assess this patient for cardiac conduction abnormalities. An EKG is a non-invasive test that records the electrical activity of the heart and can detect abnormalities in heart rhythm and conduction, such as arrhythmias, heart block, and other cardiac abnormalities.

BNP (brain natriuretic peptide) is a blood test that measures levels of a hormone released by the heart in response to changes in pressure or volume, and it is typically used to diagnose and monitor heart failure.

Chest X-ray is an imaging test that uses radiation to produce images of the heart and lungs, and it is often used to diagnose and monitor various cardiac and pulmonary conditions, such as pneumonia, congestive heart failure, and pulmonary edema.

Troponin is a blood test that measures levels of a protein released into the bloodstream when the heart muscle is damaged, and it is used to diagnose and monitor acute coronary syndromes, such as heart attacks.

While these monitoring parameters may be useful in assessing cardiac function, they are not specific to detecting cardiac conduction abnormalities, which is best evaluated with an EKG.

Current labs reveal

- SpO2 = 92%
- Pulse = 98 BPM
- BP = 152/88 mmHg
- Respiratory rate = 36 resp/min
- BNP = 986 pg/mL

193. Which of the following agents would be most critical to administer first?

A. Nitroprusside
B. Digoxin
C. Labetalol
D. Torsemide

Answer D. With the elevated BNP (≥ 100 pg/mL) and symptoms of fluid overload, this patient is likely having an episode of acute heart failure decompensation. In most cases, rapid relief of congestion and reduction of fluid overload are the primary goals of initial

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therapy for acute heart failure decompensation. Loop diuretics (such as torsemide) act quickly to reduce fluid overload and congestion, often within hours of administration, making them the most critical agent to administer first during acute heart failure hospitalization.

Answer the following two questions based on the following scenario. The ambulance arrives at the emergency department with a 35-year-old male who was just in a car accident. Because of the injuries to his chest, he is having an incredibly difficult time breathing and the provider would like to intubate him.

194. Which of the following agents should be selected to ensure the most rapid intubation?

A. Dantrolene
B. Cisatracurium
C. Succinylcholine
D. Intrathecal baclofen

Answer C.
Succinylcholine is the agent that should be selected to ensure the most rapid intubation. Succinylcholine is a depolarizing neuromuscular blocker that works quickly and has a rapid onset of action. It is commonly used for rapid sequence intubation in emergency situations.

Dantrolene is a medication used to treat malignant hyperthermia, a rare but life-threatening condition that can occur during anesthesia. It is not used for intubation. Cisatracurium is a non-depolarizing neuromuscular blocker that works more slowly than succinylcholine and has a slower onset of action. It is sometimes used for intubation in patients who cannot tolerate succinylcholine or in situations where a longer duration of muscle relaxation is desired.

Intrathecal baclofen is a medication used to treat spasticity, and it is not used for intubation.

195. It is determined that the patient will need to be placed on a longer acting agent, pancuronium. Which of the following agents would be utilized as a reversal agent for pancuronium?

A. Pilocarpine
B. Succinylcholine
C. Fluorouracil
D. Neostigmine

Answer D.

Neostigmine would be utilized as a reversal agent for pancuronium. Neostigmine is a medication that works by inhibiting acetylcholinesterase, an enzyme that breaks down acetylcholine. This leads to an increase in acetylcholine levels, which can reverse the effects of non-depolarizing neuromuscular blockers like pancuronium. Succinylcholine, a depolarizing neuromuscular blocking agent, does not have a specific reversal agent. However, the effects of succinylcholine are relatively short-lived, and the medication is rapidly metabolized by plasma cholinesterase, an enzyme in the blood. As a result, the muscle paralysis caused by succinylcholine typically resolves within a few minutes, and the patient will begin to regain muscle

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function on their own without the need for a reversal agent.

196. Which of the following antihypertensive agents are considered safe for use during pregnancy?
   A. Methyldopa
   B. Labetalol
   C. Nifedipine
   D. All of the above

Answer D.
Methyldopa, labetalol and nifedipine are considered safe for use during pregnancy when antihypertensive therapy is necessary.

Answer the following 3 questions based on the scenario.
Jane is a 34-year-old female who has been a regular patient of yours. She presents very excitedly as she recently found out she is pregnant after years of trying. She has frequent headaches, about 4-6 per month, that range in severity. She is currently on prophylaxis for headaches and also has severe depression. Her current medications include:

- Sertraline
- Losartan
- Depakote
- TUMS (as-needed for heartburn)
- Nifedipine

197. Which medications should absolutely be discontinued today? Select all that apply.
   A. Sertraline
   B. Losartan
   C. Depakote
   D. Nifedipine

Answer – Depakote (divalproex) and losartan are known for their potential to cause birth defects and should be discontinued after alternative therapies are identified.
Nifedipine, sertraline and TUMS (as-needed) are considered safe for use during pregnancy. Depakote (divalproex) has been associated with an increased risk of birth defects, such as neural tube defects, when used during pregnancy. Losartan has also been associated with fetal toxicity and should generally be avoided during pregnancy. Therefore, both medications are typically discontinued when alternative therapies are identified, especially in females who are pregnant or planning to become pregnant.

Nifedipine and TUMS are generally considered safe for use during pregnancy. Sertraline, a selective serotonin reuptake inhibitor (SSRI) antidepressant, is also considered safe for use during pregnancy.

198. Jane is complaining of a migraine headache today and is wondering what she could take. Which is the safest initial option for abortive migraine therapy?
   A. Acetaminophen
   B. Ibuprofen
   C. Sumatriptan
   D. Fioricet

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Answer A. Acetaminophen is generally considered the safest initial option for abortive migraine therapy during pregnancy. Ibuprofen and other nonsteroidal anti-inflammatory drugs (NSAIDs) are generally not recommended during pregnancy, especially during the third trimester, due to their potential to cause complications in both the mother and the developing fetus.

Sumatriptan is a prescription medication that is specifically designed for the treatment of migraines. While it has been used in pregnancy, its safety during pregnancy has not been fully established, and it is generally reserved for cases where acetaminophen is not effective.

Fioricet is a combination medication that contains acetaminophen, butalbital, and caffeine. While acetaminophen is generally considered safe during pregnancy, butalbital and caffeine are not recommended due to their potential to cause fetal harm.

199. Three weeks later, Jane presents to the ER with a hypertensive emergency. Which of the following agents would be the best choice for immediate reduction of blood pressure and for the safety of the fetus?
    A. Captopril
    B. Spironolactone
    C. Nitroprusside
    D. Labetalol

Answer D.

Labetalol would be the best choice for immediate reduction of blood pressure and for the safety of the fetus in a pregnant patient with a hypertensive emergency. Labetalol is a medication that is commonly used in the management of hypertension during pregnancy. It works by blocking both alpha and beta adrenergic receptors, which leads to a decrease in blood pressure.

Captopril and other angiotensin-converting enzyme (ACE) inhibitors are generally not recommended during pregnancy due to their potential to cause fetal harm.

Spironolactone is a diuretic that is sometimes used in the management of hypertension, but it is generally not recommended during pregnancy due to its potential to cause feminization of a male fetus.

Nitroprusside is a potent vasodilator that is sometimes used in the management of hypertensive emergencies. However, it is generally not recommended during pregnancy due to its potential to cause fetal hypoxia.

200. A 58-year-old male is rushed to your emergency department with complaints of chest pain. He is diagnosed with unstable angina. Which of the following assessments would be most appropriate to determine the likelihood of a cardiac ischemic event and help determine the urgency for further intervention?
    A. CHADS2-Vasc
    B. TIMI
    C. PHQ-9
    D. CURB-65

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Answer B.
The TIMI score (Thrombolysis In Myocardial Infarction) would be the most appropriate assessment in this scenario to determine the likelihood of a cardiac ischemic event and help determine the urgency for further intervention.

The PHQ-9 (Patient Health Questionnaire-9) is a screening tool used to assess the severity of depression in adults. CURB-65 is a clinical prediction rule used to assess the severity of community-acquired pneumonia (CAP) in adults and to determine the need for hospitalization. Currently, the Infectious Diseases Society of America (IDSA) and the American Thoracic Society (ATS) recommend using the Pneumonia Severity Index (PSI) as the preferred clinical prediction tool for community-acquired pneumonia, rather than the CURB-65 score.

The CHA2DS2-VASc score is a clinical prediction tool used to assess the risk of stroke in patients with atrial fibrillation (AF). The score is used to guide decisions about anticoagulation therapy in patients with AF, with higher scores indicating a greater risk of stroke and thus a greater potential benefit from anticoagulation.

201. Which of the following is the most appropriate initial urate-lowering therapy for a patient with a history of recurrent gout attacks?

A. Allopurinol
B. Febuxostat
C. Probenecid
D. Colchicine

Answer A. Allopurinol is the most appropriate initial urate-lowering therapy for a patient with a history of recurrent gout attacks. Allopurinol is a xanthine oxidase inhibitor that reduces the production of uric acid in the body, making it a useful first-line medication for the management of gout.Febuxostat is another xanthine oxidase inhibitor that can be used if allopurinol is not well-tolerated or if there is an inadequate response to allopurinol therapy. Probenecid is a uricosuric medication that increases uric acid excretion by the kidneys. It is generally not used as a first-line therapy because it can be less effective than xanthine oxidase inhibitors and has a higher risk of adverse effects. Colchicine is not a urate-lowering therapy but is often used for the treatment of acute gout attacks or for prophylaxis against gout flares during initiation of urate-lowering therapy.

202. With respect to medication errors, which of the following is true?

A. ‘Wrong patient’ errors are the most common medication errors
B. Medication omissions are usually the highest risk errors
C. Punitive action is the most effective strategy to improve patient safety
D. A strong emphasis should be placed on minimizing errors with high risk medications like insulin, opioids, and anticoagulants

Answer D.
Focusing on high risk medications and finding ways to minimize errors with these medications is very important and a strong emphasis should be placed on looking at processes surrounding medication dispensing, ordering, and/or administration. The other statements above are false. Omissions are the most common type of error. Wrong patient errors are typically more high risk than medication omissions. Punitive action for errors is typically not recommended for reducing errors and improving safety.

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203. Which of the following would be the least effective strategy in assessing nurses' skill improvement following a presentation surrounding medication administration?

A. Pre and post-testing
B. Audit medication administration following presentation
C. Evaluation forms for the speaker presenting the information
D. Reviewing future medications error reports and comparing them to reports prior to the education

Answer C.
The least effective strategy would be evaluation forms of the speaker, this does not indicate in any way the amount or quality of knowledge retained.

204. A 20-year-old female is seeking birth control. She has been reluctant to take birth control because her roommate complained about how it made her nauseous all the time. She is also worried about breakthrough bleeding. She would prefer a daily pill versus any other birth control administration method. Which would be the most appropriate?

A. Levonorgestrel 0.1 mg/ethinyl estradiol 20 mcg once daily
B. Norethindrone 0.35 mg once daily
C. Mirena
D. Norgestrel 0.5 mg/ethinyl estradiol 50 mcg

Answer A.
Higher doses of estrogens in birth control pills are generally associated with a higher risk of nausea as a side effect. This is because estrogens can stimulate the production of stomach acid, which can cause nausea and vomiting. Lower doses of estrogens are generally better tolerated. Progestin-only pills (POPs), such as norethindrone 0.35 mg, are generally associated with more breakthrough bleeding than combination oral contraceptives (COCs). Mirena, is a levonorgestrel-releasing intrauterine device (IUD) that is inserted into the uterus by a healthcare provider. While it is a highly effective form of birth control and can last for up to 5 years, it is not the patient's preferred method of administration.

Answer the following 2 questions based on the following scenario.

JT is a 54-year-old male with rheumatoid arthritis and hyperlipidemia. He presents with an LDL of 194 mg/dL, triglyceride level of 143 mg/dL, total cholesterol of 296 mg/dL, and HDL of 58 mg/dL. He has a history of MI and is currently on simvastatin 20 mg daily.

205. Which action would be most appropriate?

A. Education regarding lifestyle changes to reduce cholesterol
B. Add Tricor
C. Add niacin
D. Recommend no changes
E. Change simvastatin to atorvastatin 40 mg daily

Answer E.
The patient has established ASCVD (history of myocardial infarction) and elevated LDL levels. Currently, the patient is not receiving high-intensity statin therapy (rosuvastatin 20-40 mg or

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atorvastatin 40-80 mg) despite a clear indication. At this time, the most appropriate action would be to change to atorvastatin 40 mg daily. Further intensification of lipid therapy may be necessary at follow-up visits.

In addition to simvastatin, he is also on:

- Leflunomide
- Prednisone
- Omeprazole
- Famotidine
- Aspirin

206. Which medication would be most likely to contribute to elevated triglycerides?

A. Leflunomide
B. Prednisone
C. Omeprazole
D. Famotidine

Answer B.
Prednisone has been shown to increase serum triglyceride levels, which can contribute to the development of cardiovascular disease.

Leflunomide is a disease-modifying antirheumatic drug (DMARD) that is used to treat rheumatoid arthritis. It has been associated with elevations in liver enzymes and cholesterol levels, but it is not typically associated with elevations in triglycerides.

Omeprazole and famotidine are both medications that are used to treat gastroesophageal reflux disease (GERD) and other acid-related conditions. They are not typically associated with elevations in triglycerides.

207. JS presents with increasing shortness of breath. He is 49 years old and has had pneumonia before, but not for a few years. He has not been recently hospitalized and has a mild fever of 101 degrees Fahrenheit. There is significant resistance to macrolide antibiotics in the community. Which of the following would be the most appropriate antibiotic selection for empiric treatment of community-acquired pneumonia?

A. Ciprofloxacin
B. Clarithromycin
C. Doxycycline
D. Vancomycin
E. Metronidazole

Answer C. Of the listed options, doxycycline is the most appropriate choice for empiric therapy. Due to the noted macrolide resistance use of clarithromycin is not preferable. Ciprofloxacin does not provide necessary coverage against S. pneumoniae (primary pathogen of community acquired pneumonia). Intravenous vancomycin may be part of appropriate therapy (for MRSA coverage) when managing the patient in the inpatient setting, but the patient does not require inpatient treatment (and oral vancomycin would not be appropriate). Metronidazole is primarily used to treat anaerobic bacterial infections, such as bacterial vaginosis or intra-abdominal infections, and is not effective against the common pathogens

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that cause community-acquired pneumonia.

208. A 35-year-old female has a history of substance abuse. She also has major depression and is on sertraline 150 mg daily. She has tried 200 mg per day in the past but felt too sedated on that dose. Her PCP feels that she needs additional therapy and would like to try an atypical antipsychotic that will have a low risk for weight gain as well as sedation. Which of the following would be most appropriate?

A. Olanzapine
B. Quetiapine
C. Risperidone
D. Aripiprazole

Answer D.
Aripiprazole is an antipsychotic that will likely have the least weight gain as well as a lower risk of sedation. It is also indicated for augmenting antidepressant therapy.

Answer the following 4 questions based upon the scenario below.

A new medication has been developed to help with the management of fever. The medication was given to one group of patients and a placebo was given to the other group of patients. The mean reduction in body temperature was (0.9-2.4 degrees Fahrenheit) with a confidence level of 95%.

209. What type of data is body temperature?

A. Ratio
B. Nominal
C. Ordinal
D. Interval

Answer D. Interval data is data that is measured on a numerical scale, where the differences between the values are consistent and meaningful. However, there is no true zero point. Examples of interval data include temperature (measured in Celsius or Fahrenheit) and IQ scores.
Ordinal data is ranked in a particular order or sequence, but the differences between the values are not necessarily equal or consistent. Examples of ordinal data include rankings, letter grades, and symptom scales.

Nominal data is data that is categorized into distinct groups or categories, with no inherent order or ranking. Examples of nominal data include eye color, race, and blood type.
Ratio data is data that is measured on a numerical scale, where the differences between the values are consistent and meaningful, and there is a true zero point. Examples of ratio data include weight, height, and blood pressure.

210. Which of the following would be false if the data follows a normal distribution?

A. 95% of the data would fall within 2 standard deviations of the mean
B. The mean is equal to the median
C. Normal distribution classically follows a bell-shaped curve
D. The standard deviation will equal the mode

Answer D would be false if the data follows a normal distribution.
In a normal distribution, the mean and median are equal, so option B is true. The

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normal distribution is also classically described as a bell-shaped curve, so option C is true. Additionally, about 95% of the data falls within 2 standard deviations of the mean, so option A is also true.

However, the mode of a normal distribution is not necessarily equal to the standard deviation. In fact, the normal distribution does not necessarily have a well-defined mode, as it is a continuous probability distribution.

211. Is this reduction in body temperature considered statistically significant?

A. Yes
B. No

Yes, because the reduction was between 0.9 and 2.4 degrees Fahrenheit the reduction was considered statistically significant. If the data range contained the value 0, it would not have been considered significant.

212. After review, it was noted that the participants in the treatment group had a higher average temperature at baseline than the placebo group. What type of bias would this most likely be?

A. Recall
B. Analytical
C. Selection
D. Observer

Answer C.
The type of bias that is most likely present in this situation is selection bias.
Selection bias occurs when the selection of participants for a study is not random, resulting in groups that are not comparable at baseline. In this case, the participants in the treatment group were not comparable to those in the placebo group, as they had a higher average temperature at baseline. This could affect the results of the study, as the higher temperature could have an effect on the outcome being measured, independent of the treatment or placebo being given.

Recall bias occurs when there is a systematic difference in the accuracy or completeness of information that is reported by participants in different groups. Analytical bias occurs when there is a flaw in the way data is collected or analyzed. Observer bias occurs when the observer's knowledge of the participant's group assignment influences the way they collect or interpret data. These types of bias are less likely to be present in this situation, as the bias in this case is related to the selection of participants for the study.

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Answer the following three questions based on the following scenario.

A clinical trial has been set up and two groups were compared for reduced pain in fibromyalgia. One group received Fibrono 25 mg daily and the other received placebo. Fibrono significantly reduced the Somatic Symptoms Scale-8 (SSS-8) score with a p-value <0.001 compared to placebo.

213. What type of clinical research does this represent?

A. Review article
B. Controlled clinical trial
C. Cohort
D. Case study

B. The setup of two groups receiving a treatment and placebo is a classic example of a controlled clinical trial.

214. What type of data is the SSS-8 scale?

A. Ratio
B. Nominal
C. Ordinal
D. Interval

Answer - C. Ordinal data is ranked in a particular order or sequence, but the differences between the values are not necessarily equal or consistent. Examples of ordinal data include rankings, letter grades, and symptom scales.

Nominal data is data that is categorized into distinct groups or categories, with no inherent order or ranking. Examples of nominal data include eye color, race, and blood type.

Interval data is data that is measured on a numerical scale, where the differences between the values are consistent and meaningful. However, there is no true zero point. Examples of interval data include temperature (measured in Celsius or Fahrenheit) and IQ scores.
Ratio data is data that is measured on a numerical scale, where the differences between the values are consistent and meaningful, and there is a true zero point. Examples of ratio data include weight, height, and blood pressure.

215. Within a research article, under which heading would the detailed description of doses used and timeframe of the study generally be listed?

A. Discussion
B. Results
C. Conclusion
D. Methods

Answer D. The Methods section of a clinical trial will generally contain this information.

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Answer the following 5 questions based on the scenario below.

Researchers are looking at studying the use of hydrochlorothiazide as a preventative therapy for osteoporosis. They have set up two groups. One group will receive placebo and one will receive hydrochlorothiazide 25 mg daily. Over the course of one year, 25 of the 950 study participants in the hydrochlorothiazide group developed osteoporosis. In the placebo group, 33 of the 934 study participants developed osteoporosis. The p-value reported for the difference was 0.031 (alpha=0.05).

216. Did hydrochlorothiazide reduce the risk of osteoporosis?

A. Yes
B. No
C. Too little information to tell

Yes. The p-value was less than alpha (0.05), so this result would be considered statistically significant.

217. Calculate the absolute risk reduction. (Round to the nearest tenth of a percent)

Fill in the Blank: **0.9%**

Absolute risk reduction (ARR) = | % placebo group - % active group |
Placebo group: 33/934 = 0.035 = 3.5%
Active group: 25/950 = 0.026 = 2.6%

ARR = | 3.5% - 2.6% | = **0.9%**

218. What is the relative risk? (Round to the nearest whole percentage)

Fill in the Blank: **0.74**

Relative risk = incidence in treatment group/incidence in placebo group =
0.026/0.035 = 0.74

Answer = 0.74
Remember that a relative risk of 1 essentially means that there is no difference between the groups. If the relative risk is greater than 1, it is going to indicate that the treatment group increases the risk of something compared to placebo. If the relative risk is less than 1 it conveys that the treatment group has a protective effect. In this case, we see that hydrochlorothiazide demonstrates evidence of improved protection against osteoporosis compared to placebo.

219. What is the relative risk reduction?

Fill in the Blank: **26%**

Answer - RRR = 1-relative risk
Relative risk (from above = 0.74)

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RRR = 1 – 0.74 = 0.26 or 26%
Answer = 26%
Remember that relative risk reduction will always sound a lot better than the absolute risk reduction.

220. What is the Number Needed to Treat (NNT)? (Round to nearest whole number)

Fill in the Blank: **111**

NNT = 1/ARR = 1/0.9% = 1/0.009 = 111
Answer = **111**

This is not a very good NNT, it essentially means that we need to treat 111 patients for one year to prevent one case of osteoporosis.

221. You are asked to compound 1.5% triamcinolone cream. You currently have triamcinolone cream in strengths of 3% and 0.5%. How much 3% cream will this compound require if the order is written for 30 grams?
Fill in the Blank: **12 grams of the 3% strength**

This answer can be solved using the alligation method.

Available	**Desired**	**Proportions**
3%	->	1 part of 3%
…	1.5%	…
0.5%	->	1.5 parts of 0.5%
…	…	2.5 parts (total)

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Subtract 1.5% from 3% to determine the number of parts of 0.5% strength (1.5 parts). Subtract 0.5% from 1.5% to determine the number of parts of 3% strength (1 part). This yields a total of 2.5 parts.
30 grams/2.5 parts = 12 grams per part.
Based on the above calculations:
12 grams (1 part) of the 3% strength and 18 grams (1.5 parts) of the 0.5% strength are needed.

222. A female patient comes into the pharmacy to pick up her husband's prescriptions. She is of child bearing age. Which medication would you caution her about giving or touching?

A. Flomax
B. Pantoprazole
C. Finasteride
D. Tramadol

Finasteride can cause birth defects in male fetuses. Women who are pregnant or may become pregnant should not handle finasteride, especially when broken or crushed, due to risk of possible exposure to a male fetus.

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Answer the following three questions based on the information below.

Funnypenem 100 mg/kg per day IV has been ordered. The infusion is ordered every 12 hours. Funnypenem comes in 2 gram vials. The patient's current weight is 111 kg.

223. How many vials per dose are necessary?

Fill in the Blank: **3 vials**

111 mg/kg/day x 100 kg = 11,100 mg daily = 5,550 mg per infusion (given twice daily)
5,550 mg per infusion requires a total of 3 two-gram vials (6000 mg total) for each dose.

To reconstitute 2 grams of Funnypenem, it requires 6.8 mL of diluent. After reconstitution, the vial will contain 10 mL with a concentration of 200 mg/mL. Funnypenem is usually added to a 50 mL bag of normal saline and infused over one hour.

224. What is the final concentration in the infusion bag (in mg/mL)?

Fill in the Blank: **33.3 mg/mL**

In this case, the volume of the medication (10 mL) needs to be added to the volume of normal saline (50 mL) prior to calculating the total concentration.
2000 mg / 60 mL = **33.3 mg/mL**

225. What is the powder volume of the Funnypenem vial?

Fill in the Blank: **3.2 mLs**

To calculate the powder volume of the medication in the vial, subtract the diluent volume (6.8 mL) from the total reconstituted volume (10 mL).
10 mL - 6.8 mL = **3.2 mL**

BONUS QUESTIONS

HIV QUESTIONS

Which of the following HIV medications is associated with a risk of hypersensitivity reactions in patients with the HLA-B*5701 allele?

A. Abacavir
B. Rilpivirine
C. Darunavir
D. Tenofovir

Answer A.
Abacavir is associated with a risk of hypersensitivity reactions in patients with the HLA-B*5701 allele, and screening for this allele is recommended prior to starting abacavir therapy.

What is the primary difference between tenofovir disoproxil fumarate (TDF) and tenofovir alafenamide (TAF) in terms of their use as antiviral agents in the treatment of HIV?

A. TDF is associated with higher rates of bone loss and renal toxicity compared to TAF.
B. TAF has a higher genetic barrier to resistance compared to TDF.

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C. TAF is contraindicated in patients with HIV/HCV coinfection.
D. TDF is dosed less frequently than TAF.

Answer: A
TDF is associated with higher rates of bone loss and renal toxicity compared to TAF. While both TDF and TAF are used as antiviral agents in the treatment of HIV, TAF has been developed to be a more potent and less toxic prodrug of tenofovir. TAF has been shown to have similar antiviral efficacy to TDF but with fewer renal and bone-related adverse effects.

Which of the following would be considered an appropriate initial antiretroviral regimen for a person with HIV?

A. Biktarvy
B. Apretude
C. Truvada
D. Descovy

Answer A.
Biktarvy would be considered an appropriate initial antiretroviral regimen for a person with HIV. Biktarvy is a single-tablet regimen that contains three active ingredients: bictegravir, emtricitabine, and tenofovir alafenamide (TAF). Bictegravir is an integrase strand transfer inhibitor (INSTI) that blocks the integrase enzyme, which is required for HIV replication. Emtricitabine and TAF are nucleoside reverse transcriptase inhibitors (NRTIs) that block the reverse transcriptase enzyme, which is required for HIV to convert its RNA into DNA.
Truvada and Descovy are also antiretroviral medications used to treat HIV, but they are not complete regimens on their own. Truvada contains emtricitabine and tenofovir disoproxil fumarate (TDF), while Descovy contains emtricitabine and tenofovir alafenamide (TAF). Both medications are often used in combination with other antiretroviral medications as part of a multi-drug regimen. These medications can be used on their own for PrEP therapy to prevent HIV infection, but not on their own for active treatment.
Apretude (extended-release cabotegravir injection) is only approved for use as PrEP therapy, not active treatment of HIV infection.

In general, which of the following regimens are recommended for most persons with HIV?

A. 1 NNRTI + 2 INSTIs
B. 2 NRTIs + 1 INSTI
C. 1 PI + 1 NRTI + 1 NNRTI
D. 1 NNRTI + 2 NRTIs

Answer B.
The recommended initial regimen for most persons with HIV is 2 NRTIs + 1 INSTI. This combination is known as "triple therapy" and has been shown to be highly effective in suppressing HIV viral load and increasing CD4 cell counts.

For an HIV infected patient, at what CD4+ threshold should Mycobacterium avium complex (MAC) prophylaxis be initiated?

A. < 200 cells/mm3
B. < 100 cells/mm3
C. < 50 cells/mm3
D. < 25 cells/mm3

Answer C.
The current guidelines from the Department of Health and Human Services (DHHS) recommend that Mycobacterium avium complex (MAC) prophylaxis be initiated when the CD4+ T-cell count falls below 50 cells/mm3 (or if the patient has a history of disseminated MAC).

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—--------ONCOLOGY—-------

Which of the following chemotherapeutic agents has a maximum lifetime cumulative dose due to cardiotoxicity?

A. Doxorubicin
B. Paclitaxel
C. Vinblastine
D. Bleomycin

Anthracyclines have recommended lifetime cumulative dose limits due to cardiotoxicity risks. Doxorubicin is an anthracycline and has a cumulative lifetime dose limit of 550 mg/m2 (or lower with patients at higher risk of cardiotoxicity).

Which of the following severe toxicity concerns is included in the boxed warning for bleomycin?

A. Cardiotoxicity
B. Ototoxicity
C. Pulmonary toxicity
D. Hepatotoxicity

Pulmonary fibrosis is a severe toxicity included in the boxed warning for bleomycin. Because of this, the lifetime cumulative dose limit for bleomycin is 400 units.

Which of the following is a notable safety concern commonly associated with taxanes?

A. Hemorrhagic cystitis
B. Loss of hearing
C. Acute kidney failure
D. Peripheral neuropathy

Peripheral neuropathy is a well known safety concern associated with taxanes.

Ifosfamide, a chemotherapy agent, is always given with mesna. What is the purpose of mesna when given as an adjunct to ifosfamide?

A. Acts as a pharmacokinetic booster
B. Acts downstream of ifosfamide to increase efficacy
C. Reduces the risk of myelosuppression
D. Reduces the risk of hemorrhagic cystitis

Ifosfamide is associated with risk of potentially severe hemorrhagic cystitis. Mesna should be given prophylactically to reduce this risk, as stated in the boxed warning for ifosfamide.

Which characteristic side effect is included in the boxed warning for irinotecan?

A. Peripheral neuropathy
B. Diarrhea
C. Loss of taste
D. Severe nausea and vomiting

Although many chemotherapy agents can cause diarrhea, it is especially well associated with irinotecan. Early onset diarrhea may be treated with atropine. Late onset diarrhea may be treated with loperamide.

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